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Contents

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Acclimatisation to altitude: Effects on arterial oxygen saturation and pulse rate during prolonged exercise at altitude

M D Stoneham and R J Pethybridge

Abstract

Changes in the arterial haemoglobin oxygen saturation (SaO_2) of the blood in the blood pressure and in the heart rate were monitored in subjects performing static exercise at an altitude of 3 600 metres before and after an acclimatisation period of 28 days during an expedition to the Bolivian Andes It was found that acclimatised subjects could maintain their SaO_2 during prolonged exercise better than non-acclimatised subjects The pulse rate of acclimatised subjects was consistently lower at the same work level than that of non acclimatised subjects Acclimatised subjects were able to reach higher levels of exercise than when they had first arrived at altitude These data imply that acclimatisation to altitude improves the delivery of oxygen to the tissues The mechanism of this is not certain but it may be concerned with a reduction in the degree of ventilation perfusion inequality of the lung which occurs on exposure to high altitude

INTRODUCTION

Since man started climbing mountains it has been known that his capacity for exercise is decreased at high altitude Acute exposure to high altitude causes dramatic reductions in the capacity to do work It was clear to early physiologists that the acclimatised natives had a much greater exercise tolerance than the relatively unacclimatised climbers

Acclimatisation to altitude causes physiological changes in different systems over a variable period of time [1] Most if not all of the changes are concerned with improving the oxygen flux—the delivery of oxygen to the peripheral tissues [2] The most important factors affecting this flux are the cardiac output, the blood haemoglobin concentration and the haemoglobin oxygen saturation (SaO_2)

Measurement of the improvement in delivery of oxygen to the tissues is complicated due to the number of variables involved all of which might change with acclimatisation to altitude Measurement of the arterial haemoglobin oxygen saturation which is the proportion of the haemoglobin which is binding oxygen is useful as it is relatively independent of the haemoglobin concentration and is an indicator of tissue oxygen delivery The advent of non-invasive monitoring of arterial oxygen saturation by pulse oximetry has enabled investigators to monitor SaO_2 and pulse under more adverse conditions than was previously possible Several investigators have monitored SaO_2 in exercising subjects at altitude and shown that it is lower at rest in subjects at altitude and falls further during increasing levels of work [3]

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[2] $DO_2 = Q[(SaO_2 \times Hb \times 1.34) + (0.223 \times PaO_2)]$

where: DO_2 = oxygen flux
Q = cardiac output (l/min)
SaO_2 = arterial haemoglobin oxygen saturation (%)
Hb = Haemoglobin concentration (g/l)
1.34 = Hüfner constant (ml O_2/g Hb)
0.223 = blood/gas solubility coefficient for O_2 (ml O_2/kPa/l)
PaO_2 = arterial partial pressure of oxygen (kPa)

However [illegible] acclimatised subjects and the effects of acclimatisation on these changes have not been studied

Exercise performance at altitude tends to improve after a period of acclimatisation due to various factors Some of the factors that cause this are known such as an increase in the minute ventilation and the maximal cardiac output[4] and an increase in the alveolar partial pressure of oxygen (P_AO_2)[5] Thus we might expect an improvement in the SaO_2 of our exercising subjects at altitude after a period of acclimatisation however this has not been previously shown In this study we have investigated the changes in SaO_2 and pulse rate occurring in subjects performing maximal exercise at an altitude of 3 600 m before and after an acclimatisation period of 28 days

METHODS

Subjects used in the study were taking part in a six week British Joint Services mountaineering expedition to the Bolivian Altiplano (*Exercise Inca Lexture 1990*) Ethical committee approval for the study had been obtained All subjects were male servicemen normally resident at sea level age range 18–46 with no significant past medical history All were non-smokers High altitude experience was variable—four of the party had never ascended above 3 600 m before All subjects were physically fit and had undergone a period of physical training prior to the expedition Thus the contribution of an improvement in physical fitness on the experimental data was minimised

Testing was carried out in the exercise physiology laboratory of the Instituto Boliviana de Biologia de Alturo in La Paz Bolivia (3 600 m) Nine subjects completed both days of testing Subjects had all flown directly to La Paz from sea level The first test day was four days after arrival in La Paz (non acclimatised) the second test day was 28 days later (acclimatised) The interim period was spent climbing on various peaks in the Bolivian Altiplano up to 6 500 m altitude

On the test days each subject exercised on a static exercise bicycle (Monark) A protocol was followed starting at 60W work output for five minutes and increasing stepwise 30W every two minutes until subjective exhaustion was reached or until the workload could not be maintained Oxygen saturation of the blood (SaO_2) and pulse rate were monitored continuously via a finger probe (MiniOx IV Pulse Oximeter MSA (Britain) Ltd Coatbridge Scotland) and recorded at the end of each exercise work level Blood pressure (aneroid sphygmomanometer Timeson Ltd) and ECG (Hewlett Packard HP7712) were also monitored and recorded at each work level All recordings were continued for five minutes during the recovery period after the maximal work level had been reached by the subject

Subjects acted as their own controls at each work level Analyses of SaO_2 heart rate and blood pressure data were undertaken using the analysis of variance (ANOVA) technique for repeated measurements on subjects[6,7] The model under investigation incorporated the main effects of condition (acclimatised vs non acclimatised) workload subject and the pairwise interaction of condition and workload The hypothesis being tested concerned whether the SaO_2– HR and blood pressure workload profiles were different or not for the two conditions Transformations of the data have been performed in order to satisfy statistical assumptions of the analysis of variance (ANOVA) method

RESULTS

Tables 1 to 4 summarise the data for the nine subjects who completed both test days

Figures 1 and 2 show the profiles for the acclimatised and non-acclimatised subjects in SaO_2 and heart rate respectively

The analysis has been restricted to workloads up to and including 210W as this level was reached by all subjects both non acclimatised and acclimatised All subjects achieved a higher exercise level when acclimatised compared to their non acclimatised level ($p < 0.01$) The oxygen saturation profile for subjects exercising when they were acclimatised is significantly different from that when they were non acclimatised (ANOVA $p < 0.01$), with subjects maintaining their oxygen saturation better when acclimatised (*Table 1*) The heart rate profiles (average values at each workload) are significantly different for non acclimatised and acclimatised conditions (ANOVA $p < 0.01$) with non acclimatised higher than acclimatised during the work periods (*Table 2*) Systolic blood pressures increased steadily as the workload increased throughout the exercise protocol in all subjects diastolic pressures were unchanged There is no significant difference between the blood pressure profiles for the acclimatised and non acclimatised subjects (*Tables 3 and 4*)

Table 1 Summary values for oxygen saturation for nine subjects

	Non acclimatised				Acclimatised			
work (W)	min	max	mean	SD	min	max	mean	SD
baseline	90	95	92 4	1 7	91	95	93 2	1 5
60	84	95	89 8	3 8	92	95	93 4	1 1
90	82	93	88 8	4 2	91	95	93 7	1 4
120	79	92	86 7	4 8	90	94	92 1	1 2
150	77	90	84 9	5 2	90	94	91 7	1 2
180	77	89	83 8	4 8	87	93	90 0	1 9
210	77	89	83 2	4 4	87	92	89 0	1 7
recovery								
1 min	84	94	89 7	3 2	83	94	90 3	3 5
3 min	89	93	91 8	1 9	91	95	92 9	1 4
5 min	89	95	91 7	2 2	91	95	93 2	1 2

Table 2 Summary values for heart rate for nine subjects

	Non acclimatised				Acclimatised			
work (W)	min	max	mean	SD	min	max	mean	SD
baseline	71	93	82	6	61	88	76	10
60	96	126	115	10	81	112	98	11
90	105	134	123	9	91	124	106	11
120	116	146	137	9	101	135	124	10
150	128	162	149	10	110	152	134	13
180	145	170	161	6	120	164	146	14
210	148	178	167	9	130	176	161	14
recovery								
1 min	120	166	145	15	95	181	146	25
3 min	103	137	120	13	72	137	110	23
5 min	86	125	107	11	71	126	109	20

Table 3 Summary values for systolic blood pressure for nine subjects

	Non-acclimatised				Acclimatised			
work (W)	min	max	mean	SD	min	max	mean	SD
baseline	110	130	120 6	5 8	110	130	120 0	7 1
60	130	160	153 9	17 5	130	175	145 6	14 2
90	135	185	161 1	14 1	130	150	149 4	10 1
120	160	200	176 1	15 4	135	170	157 8	13 0
150	155	205	183 9	17 6	140	190	169 4	15 7
180	160	210	189 4	18 4	150	200	179 4	18 6
210	150	210	191 1	17 1	160	205	185 3	18 9
recovery								
1 min	140	160	154 3	7 9	150	200	170 6	17 4
3 min	130	155	147 1	12 9	120	180	146 7	17 3
5 min	125	150	135 0	9 1	120	160	133 3	13 7

Table 4. Summary values for diastolic blood pressure for nine subjects

	Non acclimatised				Acclimatised			
Work (W)	min	max	mean	SD	min	max	mean	SD
baseline	65	90	80 6	8 1	75	90	80 0	6 1
60	70	95	81 1	7 4	75	105	85 6	10 1
90	70	95	80 6	10 4	75	90	80 6	5 3
120	70	95	81 7	7 5	75	100	82 8	6 7
150	75	90	81 7	6 6	75	95	82 2	7 5
180	70	95	80 6	7 7	75	95	80 6	7 3
210	90	81 1	8 2	75	85	83 3	7 1	
recovery								
1 min	70	90	79 1	9	75	90	78 9	4 8
3 min	70	95	77 9	9	70	90	78 3	5 6
5 min	65	90	77 9	9	75	90	79 4	5 3

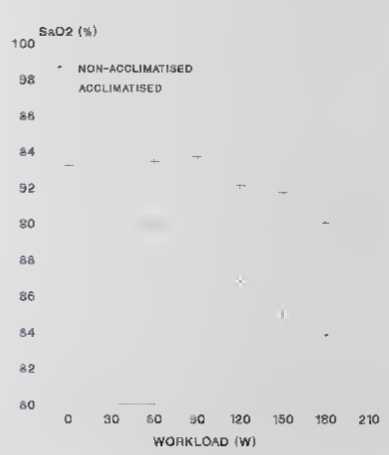

Fig 1

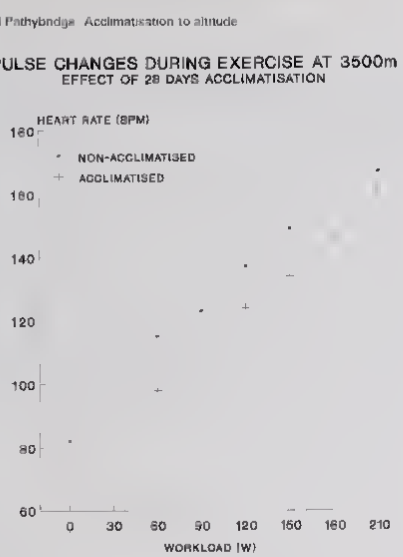

Fig 2

DISCUSSION

The MiniOx 3V pulse oximeter performed reliably during the testing although there was no absolute quality control. Several authors have shown that pulse oximetry correlates well with co-oximetry at levels above 70% saturation [8–11]. We have demonstrated a progressive decrease in SaO_2 in subjects performing maximal exercise whilst at altitude which has been shown before [2,3,12] but that this decrease is reduced in magnitude by a period of acclimatisation. We have shown that the heart rate of the exercising acclimatised subjects is less at a given exercise level than when they were non-acclimatised. Finally we have shown that higher levels of exercise can be achieved by a period of acclimatisation. It has been shown previously that heart rates decrease for a given level of exercise after a period of acclimatisation [4,12,13].

To interpret these data it is necessary to consider the physiological factors which could account for a reduction in the delivery of oxygen to the tissues. There are only four pulmonary causes of arterial hypoxaemia:

1. A reduction in the inspired F_IO
2. Hypoventilation
3. Ventilation/perfusion inequality—due to shunt or deadspace
4. Diffusion limitation of oxygen transport across the pulmonary capillary

The possible contributions of these factors in the reduction in arterial oxygen concentration during exercise at altitude were investigated in

Operation Everest II in 1985 [14,15] In this experiment eight subjects were progressively depressurised in a hypobaric chamber over 40 days until the ambient pressure in the chamber was equivalent to that of the summit of Mount Everest Extensive invasive monitoring was carried out while the subjects followed a programme of exercise testing It was shown that in hypoxic hypobaric subjects performing low levels of exercise diffusion limitation of oxygen transport across alveolar cell membranes is insignificant and the reduction in SaO_2 is primarily due to ventilation/perfusion inequalities caused by hypoxic pulmonary vasoconstriction

At higher exercise levels the oxygen consumption is greater There is a reduction in the time period available for gas transfer in the pulmonary capillaries due to the increase in heart rate Diffusion limitation of oxygen transport across alveolar cell membranes then becomes increasingly important to reducing the arterial oxygen content The cause of the ventilation/perfusion inequality is not certain however one plausible theory is that there is regional pulmonary hypoxia leading to hypoxic pulmonary vasoconstriction which causes an elevation in the pulmonary arterial pressure This leads to sub-clinical pulmonary oedema which may produce the ventilation/perfusion inequalities [1,15] In support of this a raised pulmonary arterial pressure is certainly a feature of *chronic* exposure to altitude

In order to explain the changes in SaO_2 seen due to acclimatisation one or more of the factors responsible for arterial hypoxaemia must change Obviously the F_IO_2 did not change between the two test days as they took place in the same laboratory at the same atmospheric pressure An increase in minute ventilation is well described as an acclimatisation response although this response is considered to be complete after one week [16] Thus our subjects would already have been hyperventilating when they performed the first test day and their minute volumes would not have increased further after 28 days of altitude [1] Measurement of the subjects minute volumes during the testing would have helped to clarify this Diffusion limitation of oxygen transport into the pulmonary capillaries is a function of the thickness and the area of the membrane available and has been shown to be unaltered by acclimatisation—even by periods of up to several months. [7,19,20,2]

Other factors must therefore account for the observed changes in SaO_2 There is evidence from Operation Everest II that ventilation/perfusion inequalities are most likely to be seen in poorly-acclimatised subjects after a rapid ascent to altitude [15,12] Thus it may be that the improvement in SaO_2 is due to an improvement in the ventilation/perfusion ratio

Other major physiological changes are known to occur in acclimatising subjects which improve the oxygen delivery Polycythaemia is a well recognised feature of chronic exposure to altitude—but this would not affect the oxygen saturation of the haemoglobin directly There may also be changes in the distribution and population of subcellular organelles again without direct effect on the SaO_2

The results of the experiments performed show that there are changes in the delivery of oxygen which occur due to acclimatisation to altitude These results support the hypothesis that ventilation/perfusion inequality in the lungs induced by exposure to altitude is reduced by a period of acclimatisation to altitude The delivery of oxygen to the tissues is therefore enhanced, producing an improvement in performance Other factors may be involved. Actual measurement of ventilation/perfusion ratios in acclimatised and non-acclimatised subjects would help to confirm or refute this hypothesis

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The concept of an 'Integrated Survival System' for protection against the responses associated with immersion in cold water

M J Tipton

Abstract
In this paper the concept of an Integrated Survival System (ISS) is introduced and discussed in relation to the helicopter passenger/crew member although the principles are equally applicable to many other types of user and circumstance requiring specialized protective clothing.

The fundamental principles behind this concept are first that the wearer should be given protection against all of the hazardous responses associated with immersion in cold water and secondly that the individual components which make up the ISS must be compatible and complementary they may also be interdependent

INTRODUCTION

The first step in the design of an ISS for any purpose is to identify all of the hazardous responses likely to be encountered by the wearer With regard to the helicopter passenger this approach requires the hazardous responses associated with immersion in cold water to be identified and considered There is therefore a clear requirement for an understanding of the relevant basic physiology of cold water immersion and for this knowledge to be employed at an early stage in the design of a system

HAZARDOUS RESPONSES ASSOCIATED WITH IMMERSION

In recent years the risk associated with cold water has tended to be thought of solely in terms of hypothermia or a fall in body core temperature The perception that hypothermia is the major threat faced by individuals who are immersed in cold water has influenced thinking in many areas, including the design of immersion protective clothing and claims for its performance the tests and standards used to evaluate such clothing and the policies employed to determine which types of protective clothing are acceptable and when they should be worn [1]

Despite the attention which hypothermia has received anecdotal [2] statistical [3 4] and experimental[5] evidence suggests that other responses associated with immersion in cold water can present a significant threat to life Golden and Hervey[6] have listed four stages of immersion in cold water associated with particular risk, these are

1 Initial immersion (0–3 min)
2 Short term immersion (3–15 min)
3 Long-term immersion (30 min+)
4 Post immersion

Normally the possibility of hypothermia does not occur until stage three before this the immersed individual must survive the initial responses to immersion in cold water These responses have been given the generic title of the cold shock response and are summarised in *Figure 1* In recent years it has become increasingly apparent that the initial cardiovascular and respiratory responses evoked by immersion in cold water are probably the most

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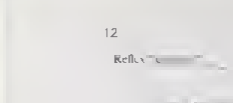

Fig. 1 The initial responses to cold water immersion

hazardous of all of the responses associated with immersion. In particular the significant reduction in maximum breath hold time on immersion is potentially especially hazardous for individuals who may require to perform a breath hold in order to escape from a submerged boat or craft.

It follows from this that the protective equipment provided for individuals at risk of immersion in cold water the tests and standards by which such equipment is judged and the policies for the use of such equipment should reflect all of the hazardous responses associated with immersion in cold water and not just those which result in a fall in core temperature.

Acceptance and implementation of this has profound implications for several areas including the estimation of survival time, policies for the use of immersion suits and types of immersion suits recommended.

With regard to survival time consideration will have to be given to the fact that the cold shock response may incapacitate immersion victims in seconds as opposed to the tens of minutes required by hypothermia. The requirement to wear immersion suits, currently determined by the relationship between water temperature, insulation and time to hypothermia will also have to take account of the relationship between water temperature and the magnitude of the cold shock response.

Finally the definition of what constitutes an effective immersion suit currently based on the protection provided against hypothermia may alter when the cold shock response is also considered. As this response is evoked by rapid falls in skin temperature, clothing which reduces this rate of fall should attenuate it. It is likely therefore that immersion suits which keep the majority of the surface area of the body dry on immersion (dry suits) will have an inherent advantage over suits which because they do not possess watertight wrist and neck seals do not achieve this.

Thus, despite the fact that many wet suits have been reported to provide adequate protection against hypothermia sometimes equivalent or better than that seen with dry suits[7,8] this may not be the case when considering the protection provided against the cold shock response[9].

MAJOR COMPONENTS OF A HELICOPTER PASSENGER/CREW ISS

Having identified the responses against which protection is required the next step in the design of an ISS is the provision of protective equipment constructed from the most appropriate materials and combined in a way that ensures integration and compatibility. This step may be most efficiently achieved by co-operation between individuals with detailed knowledge of physiology, ergonomics, engineering textiles and modern manufacturing techniques.

It should be emphasised that only the major components of a helicopter passenger/crew ISS are discussed, other equipment such as gloves, splash-guard, buddy line and so on should also be present within an ISS. The general point of importance is that such additional items must also conform with the principle of compatibility. Additionally only protection against cold water will be addressed, there are clearly many other considerations required in the design and evaluation of a helicopter passenger/crew ISS. These include fire protection, comfort in air, durability, snagging, avoidance, mobility in air and water.

Protection against cold shock

It is clear that some protection should be provided against the cold shock response, parti

cularly the cold induced reduction in maximum breath hold time Even standard whole body helicopter passenger/crew immersion dry suits have been shown to enable average maximal breath hold times in subjects of only approximately 30 seconds during submersion in water at 10°C [9 10] Indeed some individuals are able to achieve only 12 second maximum breath-hold times in this clothing.[9]

These results provide the rationale for the inclusion of some form of emergency underwater breathing apparatus (EUBA) in a helicopter passenger/crew ISS Indeed an EUBA is considered to be an important perhaps the most important component of any helicopter passenger/crew ISS Protection against the initial respiratory responses to immersion is essential good protection against hypothermia is clearly pointless unless crew and passengers have a long enough underwater survival time to escape from an inverted or sinking helicopter

Any EUBA should preferably be simple to use require little in the way of training and not introduce any additional dangers such as pulmonary over-pressure accidents which may result in pulmonary barotrauma The demands placed upon any EUBA will be dependent in large part upon the immersion suit with which it is worn as part of the ISS

Another essential component of an ISS is therefore an immersion suit This should not only attenuate the cold shock response by significantly slowing the rate of fall of skin temperature on immersion in cold water it should also provide effective anti hypothermia protection

Protection against hypothermia

Determining which immersion suits are the most effective is often difficult Of the different makes of suit currently available it is uninsulated dry suits which have become the most popular they are thought to provide adequate protection against hypothermia whilst being relatively comfortable to wear in air when compared with either dry suits with inherent insulation or wet suits

This choice may however be in error due to the innocuous nature of many of the laboratory based evaluations on which it is based Even in these tests significant levels of water leakage into dry suits has been reported [9 10 11] In the real situation leakage is likely to be increased by wind, waves exercise and an initial period of submersion [13 14 15] as well as by wearers failing to secure their suit [illegible] in the emergency situation [16]

Such leakage will have a deleterious effect on the performance of dry immersion suits without waterproof insulation by reducing the insulation provided by the normal clothing worn beneath the suit [17 18] Tipton[13] reported a 30% reduction in the performance of an immersion suit as a result of the introduction of a light wind small waves periodic surface spraying and a 15 second period of submersion at the start of two otherwise identical laboratory tests of the same uninsulated suit The deterioration in performance was primarily ascribed to increased water leakage

Under such circumstances dry suits with inherent insulation which is unaffected by leakage will perform better than those without waterproof insulation Furthermore the provision of a suit with inherent insulation also removes the requirement for the often incorrect assumption that the wearer will provide his own adequate insulation

It is concluded that the immersion suit component of an ISS should demonstrate advanced protection against hypothermia during laboratory tests to allow for the decrement in performance which will occur in adverse real situations

Airway protection

Another critical component of an ISS is an effective means of self righting keeping the airways clear of the water and maintaining stability in a rough sea way These functions may be achieved by a lifejacket It is essential however that the lifejacket is integrated with and complementary to the other components of the ISS Many lifejackets have been reported to be unable to function correctly when worn with immersion suits [19 20]

SUMMARY AND CONCLUSIONS

In this paper the concept of the Integrated Survival System has been introduced and discussed using the example of a helicopter passenger/crew ISS The major components considered essential in such an ISS are shown in *Figure 2*

The rationale behind this concept is that the process of providing protective equipment for individuals should start with the identification of all of the hazards to which they are likely to be exposed These hazards should then be investigated and analysed to determine their nature and the best ways of attenuating the

Fig 2 Recommended major components of a helicopter passenger/crew ISS

threats associated with them. The information obtained can then be used as a basis for the development of effective protective equipment.

Where more than one hazard exists it is probable that more than one piece of protective equipment will be required. Where this is the case the different pieces of equipment should be regarded as components of a larger system. These components should be compatible and complementary and may in some cases be interdependent. In short they should constitute an Integrated Survival System.

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A clinical trial to compare plaque removing efficiency of a prototype toothbrush with alternative toothbrushes

C R Priestland and R J. Pethybridge

(Based on INM Report R92002 dated December 1991)

Summary

Three alternative toothbrushes were investigated in a double blind Latin Square repeated measures design study for their relative efficiency at removing plaque in vivo. A prototype filament suspension design toothbrush was tested with the suspension mechanism both active and inactive, against a conventional toothbrush.

Following an initial control plaque score subjects were ordered by oral hygiene levels and randomly allocated to each of the three test groups. The trial was made up of three periods of 14 days consisting of four days of no brushing followed by 10 days of brushing with each of the three toothbrushes.

All plaque scores were recorded using the Greene and Vermillion Index of Oral Hygiene and plaque scores were recorded for each patient at the start, four days later and at the end of each 14 day period.

There were no significant differences in the quantity of plaque remaining after brushing with any of the brushes tested in this study.

Ignoring the toothbrush used the end brushing average plaque scores for period 1 were found to be higher than the control plaque scores. It is suggested that this resulted from the patients finding new toothbrushes less comfortable to use initially but following a period of accommodation and adjustment end brushing plaque levels in subsequent periods returned to near the same level as the control plaque score.

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INTRODUCTION

Dental plaque has been identified as the common aetiological factor in the most common dental diseases. Dental caries and periodontal diseases cannot occur without the presence of either cariogenic or periodontopathic organisms in the oral environment [1]. It has been the aim for many years to remove as much dental plaque as possible at each session of patient hygiene in order to prevent dental disease. Many different designs of toothbrush are available both mechanical and electrical. A prototype toothbrush design incorporating filament suspension is investigated for its effect on plaque removal efficiency when used by patients.

REVIEW OF THE LITERATURE

A toothbrush has been developed which is designed to allow the tufts of filaments to move independently and therefore reach interdentally in a more effective manner than conventional toothbrush design has allowed. Such a development has been tested using a mechanical method [2]. A plexiglass model was used with V shaped spaces 2 mm deep simulating the interdental embrasure between teeth. This space was filled with paraffin to simulate dental plaque. The brushing movement was reproducibly and mechanically driven by machine. Brushing was effected in a tank containing a suspension of dentifrice in water. The efficiency of the prototype and conventional brushes under investigation were assessed by profilome-

try of the V-shaped space.[3] Amplified reproduc tions of the surface contour were produced. Two prototype suspended filament brushes were investigated: one with the filament retrac tion mechanism locked and the other with the mechanism operating as designed. Both transverse and longitudinal brushing resulted in enhanced paraffin removal from the V shaped space in the ease of the brush with the retrac tion mechanism operating. It was concluded that 'the suspension system is incontestably superior to the conventional toothbrush for penetration into spaces between teeth'.[3]

An in vitro trial was carried out[4] on ex tracted incisor teeth embedded in resin simu lating the interdental embrasure. Again the retraction mechanism was operative in one brush and inoperative in the control brush the latter achieving the situation found in most conventional fixed filament toothbrushes. The results of this in vitro study indicate that the toothbrush with an operating filament suspen sion system was superior to the conventional design. Such a trial is indicated in the human situation. It is for this reason that the present study was undertaken.

AIM

The aim of the study is to compare the plaque removing efficiency of three different tooth brushes. The toothbrushes selected for the trial included a conventional toothbrush presently a market leader and two prototype suspended filament design toothbrushes, one of which had the suspension mechanism operative, the other with the system inoperative.

MATERIAL AND METHODS

Subject selection

Thirty-six healthy male Royal Naval personnel were assessed by a clinician as suitable to take part in the trial. Subjects were questioned to ensure there was no relevant medical history and that no medication, particularly antibiot ics, had been used for a period of three months prior to the study. Prospective subjects were examined to exclude those with gross malocclu sion, active dental decay, dentures or any form of orthodontic appliance as these might influ ence the results of the trial. The responses to all questions by the assessing clinician were re corded on an examination and record sheet for each subject. An assessment by a dental hygien ist was performed to identify the plaque control regime used by each subject. Only subjects brushing twice per day were considered suitable for inclusion in this study. Furthermore only subjects who were not in the habit of using dental floss, dental tape, wedges, dental sticks, interspace brushes or bottle brushes for inter dental cleaning, were chosen. A short time was also spent in providing oral hygiene instruction to each subject to ensure uniformity of tech nique as taught to the subjects during the previous six months during Royal Navy new entry training.

Detailed information was given to each pro spective subject considered suitable for inclu sion in the study both verbally and written after which informed consent was sought.

Techniques

Each subject was examined initially and a control plaque score recorded. At the initial examination the patient's own toothbrush was surrendered in an attempt to reduce the chance of patients returning to their old toothbrushes. New brushes were provided as replacements at the end of the experimental periods. Following the control plaque score, all patients were requested to refrain from all forms of mouth and tooth cleaning, including the use of mouth washes, for a period of five days (Monday–Fri day). During this period plaque accumulation occurred. Such a short period is not sufficient to lead to irreversible dental disease.[5] On the fifth day each subject had an accumulated plaque score recorded in accordance with Greene and Vermillion's Index of Oral Hygiene.[6] All subse quent plaque scores were performed in this way. Following this accumulated plaque score each subject was given one of the three test toothbrushes for use over a period of 10 days. At the end of each brushing period an end of brushing plaque score was recorded. All con trol accumulated and end brushing plaque scores were recorded on a plaque record sheet for each subject.

Toothbrushes were allocated to subjects according to a plan designed by one of the authors. All brushes were given to subjects in a sealed envelope marked only with the subject's name, trial number and the time period within the study. Neither the dental surgeon nor the dental hygienist were allowed to discover which toothbrush subjects used during any period of the study. At the end of each toothbrushing period the toothbrush used was returned to the dental department reception staff in a sealed envelope.

Table 1 Planned dental assessments

Date	Period	Plaque scored	Toothbrush used	Tooth brushing	
				Stopped	Continued
30/09/91	1	Yes		Yes	
04/10/91	1	Yes	Yes		Yes
14/10/91	1/2	Yes		Yes	
18/10/91	2	Yes	Yes		Yes
28/10/91	2/3	Yes		Yes	
01/11/91	3	Yes	Yes		Yes
11/11/91	3	Yes			Yes

Study Design

Three different toothbrushes conventional toothbrush prototype filament suspension toothbrush [active] (referred to as suspension) prototype filament suspension toothbrush [inactive] (referred to as non suspension) all of the same colour and having had all distinguishing marks removed were assessed over three periods of time in a double blind Latin Square repeated measures design study Double blindness was maintained throughout the study period Following each period subjects were asked about their compliance to ensure that reversion to an old brush had not occurred and that no relevant medication including antibiotics had been prescribed during the experimental period All individuals were asked to continue using their usual dentifrice throughout the three experimental periods No patients required dental treatment during the experimental period of the study

Dental assessments were planned for volunteers according to *Table 1* The control plaque scores (percentage of surfaces with stainable plaque) for the preliminary assessment (dated 30/9/91) of 36 volunteers were numerically ordered In each successive set of three ordered scores the three subjects were randomly assigned one to each of the three groups Each group was given a different sequence of the three toothbrushes on the dates stated in *Tables 1 and 2*. *Table 2* summarises the toothbrushes issued to each group The design is a Latin Square of size 3

Table 2 Summary of toothbrushes issued to each group

Group	Dates		
	4/10/91	18/10/91	1/11/91
1	1	3	2
2	2	1	3
3	3	2	1

Key 1 Conventional 2 Non suspension 3 Suspension

Statistical Methods

The analyses of plaque scores or derivatives of these scores from three periods corresponded to an analysis of variance (ANOVA) method of repeated measures for a Latin Square design as described by Wiaer[6] In examining percentages the angular transformation was employed to ensure the statistical assumptions and requirements of the methodology were fulfilled The angular transformation is given by

$$y = \arcsin[(x/100)^{1/2}]$$

where x is the percentage score and y is in degrees such that $0 < y < 90$ Examination of residuals (the differences between the data and the estimated values based on a linear model incorporating the fixed effects for group period (or date) and toothbrush and assuming the volunteers to be a randomly drawn sample from a RN population) were undertaken to assess if the chosen statistical models were appropriate If any significant differences between toothbrushes or periods of brushing (i e dates) were determined by analysis of variance then the Scheffe method of multiple comparisons was employed to find the significant contrasts between toothbrushes and/or periods of brushing. All the original plaque scores (numbers of surfaces with plaque at the stated levels) derived from the dental charts were rechecked prior to analysis

Safety and Ethical Considerations

The prototype toothbrush is according to the manufacturers constructed of the same materials as those currently used for their range of toothbrushes on the market. The risk of toothbrush fracture was considered unlikely. The safety of the new brushing system has been proven by scanning electron microscopy studies. No traumatic effects could be detected in the gingival tissues following use of the new prototype toothbrush. Subjects were informed that if they had any concerns for their oral health during the study an independent dental surgeon would be available for counselling and the provision of appropriate advice to the individual. Subjects were informed that they were free to withdraw from the trial at any time with no penalties incurred.

All patients exhibiting early carious lesions were excluded from the trial as it was considered to be unethical to encourage plaque accumulation in such patients where all efforts should be directed at arresting the demineralisation.

RESULTS

Thirty six volunteers who satisfied the dental criteria set out above participated in this study. One subject had to withdraw from the study at an early stage for reasons unrelated to this investigation. In order to ensure balance in the design the data for the two subjects (one each from the other two groups) matching the preliminary plaque score for the withdrawn subject were excluded. Analyses were therefore based on 33 subjects. Each subject had the same teeth assessed on the seven assessment dates. Data have been analysed in terms of the percentages of surfaces of teeth with (i) a plaque code of 1, 2 or 3 defined as stained plaque seen, (ii) a plaque code of 2 or 3 defined as extensive or very extensive plaque seen and (iii) a plaque code of 3 defined as very extensive plaque seen.

All subjects had a minimum of 96 surfaces to be assessed for plaque on the seven occasions. *Table 3* provides some basic summary statistics on the percentages of teeth with plaque at the stated levels. At one plaque scores rose during the three periods of no brushing i.e. from 30/9/91 to 4/10/91, from 14/10/91 to 18/10/91 and from 28/10/91 to 1/11/91. No subject had less than 50% of his tooth surfaces with plaque present on the dates when brushing of teeth was resumed. Irrespective of the toothbrush used in the three periods the average plaque scores at

Table 3 Summary statistics for three levels of plaque scores (%) on assessment dates

	n	Mean	Minimum	Quartile 1	Median	Quartile 3	Maximum
Plaque Any							
30/9/91	33	33.1 (3.4)	9.9	25.0	35.4	57.1	74.1
4/10/91	33	78.5 (1.7)	59.0	73.4	80.2	84.8	94.6
14/10/91	33	43.1 (3.0)	9.0	33.0	40.9	52.7	76.9
18/10/91	33	80.1 (1.1)	64.3	78.5	79.0	83.9	97.1
28/10/91	33	33.0 (2.8)	10.7	21.4	24.0	43.8	77.7
/11/91	33	78.1 (1.5)	50.0	75.0	81.3	83.9	95.5
11/11/91	33	39.0 (3.5)	9.3	18.8	31.3	48.2	75.0
Plaque At least extensive							
30/9/91	33	13.8 (1.9)	0.0	5.4	11.1	22.3	42.8
4/10/91	33	48.2 (2.9)	21.4	33.3	45.5	62.5	91.3
14/10/91	33	23.0 (2.1)	2.7	15.7	22.2	27.1	51.9
18/10/91	33	54.9 (2.0)	33.0	44.9	57.0	65.2	72.3
28/10/91	33	15.2 (1.8)	2.7	7.3	12.0	18.8	48.0
/11/91	33	55.7 (2.4)	15.2	49.1	59.0	66.1	79.0
11/11/91	33	16.2 (2.2)	0.0	7.1	13.7	21.4	44.9
Plaque Very extensive							
30/9/91	33	7.4 (1.4)	0.0	1.8	5.2	10.7	35.7
4/10/91	33	30.6 (3.2)	0.9	15.6	24.6	47.3	86.7
14/10/91	33	14.9 (1.7)	0.9	8.0	12.5	18.8	38.3
18/10/91	33	38.8 (2.6)	9.8	23.2	38.3	47.3	63.7
28/10/91	33	5.5 (1.2)	0.0	2.7	3.6	7.8	28.6
/11/91	33	24.0 (2.2)	0.8	15.1	22.3	33.8	50.8
11/11/91	33	5.5 (1.1)	0.0	1.0	3.1	6.8	21.1

Standard error of statistic is given in ( )

Table 4 Summary statistics for percentage of plaque scores (%) for three toothbrushes at the end of brushing periods

				Quartile 2	Median	Quartile 3	Maximum
Plaque: Any							
Conventional	33	35		2	34 8	45 0	77 7
Non-suspension	33	37		7	34 8	48 2	78 6
Suspension	33	38 9		28 6	34 8	48 2	78 6
Plaque: At least extensive							
Conventional	33	7		7	14 3	23 2	48 0
Non-suspension	33	18 5		11	17 0	23 2	51 9
Suspension	33	16 9		8 3	15 7	25 0	47 8
Plaque: Very extensive							
Conventional	33	8 4		6	7	12 5	23 8
Non-suspension	33	8 8		7	6 5	11 5	38 4
Suspension	33	10 0		2 7	8 0	14 6	38 3

Standard error of statistic given in

Table 5 Analysis of variance of plaque scores (%) Any plaque Angular transformation of scores used

Source of variation	Sum of squares	Degrees of freedom	Mean squares	F ratio
Between subjects				
Groups	498 9	2	249 4	0 787
Subjects within groups	9 505 4	30	316 8	
Within subjects				
Toothbrushes	86 1	2	43 0	1 431
Period	678 0	2	339 0	11 277
Latin square residual	28 1	2	14 1	0 468
Error (within)	1 803 6	60	30 1	
Total	12 599 9			

Table 5a Summary mean values Angular transform values

Overall	37 2		
Groups 1 2 3	34 6	40 0	37 0
Periods 1 2 3	40 8	34 6	36 2
Toothbrushes (O NS S)	36 0	37 3	38 3

Table 5b Summary mean values by group and period Angular transform values

Group	Period 1	2	3
1	36 2	33 3	34 2
2	44 0	36 8	39 4
3	42 1	33 8	35 0

Table 6 Analysis of variance of plaque scores (%) At least extensive plaque Angular transformation of scores used

Source of variation	Sum of squares	Degrees of freedom	Mean squares	F ratio
Between subjects				
Groups	316 3	2	158 1	0 794
Subjects within groups	5 971 9	30	199 1	
Within subjects				
Toothbrushes	41 6	2	20 8	0 793
Period	763 4	2	381 7	14 552
Latin square residual	39 7	2	19 8	0 756
Error (within)	1 573 8	60	26 2	
Total	8 706 6			

Table 6a Summary mean values Angular transform values

Overall	23 9		
Groups 1 2 3	21 4	25 6	24 7
Periods 1 2 3	27 8	21 9	22 0
Toothbrushes (O NS S)	23 0	24 1	24 5

Table 6b Summary mean values by group and period Angular transform values

Group	Period 1	2	3
1	24 1	19 5	20 6
2	29 2	23 6	23 9
3	30 2	22 6	21 4

the end of 10 days brushing returned to levels similar to or above that found at the initial assessment (30/9/91) The average scores (for the three plaque levels) at the end of the first period of brushing were numerically higher than those at the corresponding preliminary assessment (*Table 3*)

The ANOVA analyses of the plaque scores (%) recorded at the end of the three brushing periods showed there were no significant differences between any of the toothbrushes although the average plaque scores (%) associated with the use of the soo suspension and suspension brushes had been noted (*Table 4*) as numerically worse than the corresponding figures for the conventional toothbrush These analyses (*Tables 5 6 and 7*) also confirmed the earlier impression that the overall plaque scores at the end of period 1 were significantly ($P < 0.01$) higher than the corresponding scores at the end of periods 2 and 3 These findings applied to all plaque levels considered The analyses for both the subjects natural plaque scores (%) and the angular transforms of these percentage scores provided the same findings The findings based on the angular scores are considered to be more appropriate from a statistical point of view

DISCUSSION

This study was carefully planned by the authors in conjunction with dental staff at a Royal Naval establishment before Royal Naval servicemen were asked to volunteer to trial the toothbrushes described One of the authors (a statistician) was involved in the randomisation process of the toothbrushes to subjects and he alone placed and sealed the toothbrushes in brown envelopes Volunteers were issued with one sealed envelope at the start of each brush

Table 7 Analysis of variance of plaque scores (%) Very extensive plaque Angular transformation of scores used

Source of variation	Sum of squares	Degrees of freedom	Mean squares	F ratio
Between subjects				
Groups	359 7	2	179 8	1 329
Subjects with n groups	4 060 1	30	135 4	
Within subjects				
Toothbrushes	59 1	2	29 6	1 047
Period	2 057 7	2	1 028 8	36 437
Latin square residual	12 8	2	6 4	0 226
Error (within)	1 694 2	60	28 2	
Total	8 243 5			

Table 7a Summary mean values Angular transform values

Overall	15 3		
Groups 1 2 3	12 7	15 0	17.2
Periods 1 2 3	21 7	12 8	11 4
Toothbrushes (O NS S)	14 7	14 8	16 4

Table 7b Summary mean values by group and period Angular transform values

Group	Period 1	2	3
1	18 9	10 3	8 3
2	21 4	13 0	13 6
3	24 8	14 7	12 2

ing period and told not to open the envelopes until after leaving the dental department nor to show the toothbrushes to any dental staff involved in the study at any time Toothbrushes were surrendered at the end of each period by volunteers placing their previously allocated toothbrush in a sealed envelope in a bin Dental recorders had no information of the toothbrushes used by subjects The plaque assessment forms contained no reference to toothbrushes allocated Secrecy of toothbrushes used was maintained at all times Analyses were undertaken following computer linkage of the toothbrush codes with the plaque scores

The size of the subject sample was chosen based on some estimates of average plaque scores Power calculations for the sample size used in the data analyses indicate that a 85% specificity level and a relative 20% difference between plaque (%) scores for the conventional toothbrush and suspension toothbrushes would yield an estimated power (sensitivity) of 85% (approx) In this study the non suspension and suspension toothbrushes were not found to be significantly better or worse than the conventional toothbrush at reducing average plaque scores in a group of subjects Larger sample studies would be required to ascertain if these toothbrushes were significantly worse than the conventional toothbrush at removing plaque This study also indicates that there was no differential in favour of the suspension toothbrush over the non-suspension toothbrush in removing plaque

All plaque scoring was performed by a single examiner a dental hygienist of five years experience All plaque scoring was carried out with the additional benefit of plaque staining using a vegetable dye in order to make the identification of dental plaque on proximal

[illegible] available in the dental surgery normally used by the involved dental hygienist. The dental recorder was a qualified dental surgery assistant of 4½ years experience who was used to working with the dental hygienist.

Each patient was allocated a 10 minute appointment for the recording of a plaque score. This period of time was considered to be sufficient to accurately record the levels of plaque using the Greene and Vermillion Oral Hygiene Index for all surfaces of all teeth present excluding third molars.

All the patients taking part in the study received a full verbal explanation of the aim of the study and the plan of the study. Following verbal explanation each subject read prepared information sheets and after reading the document were asked if they had any questions. Once all questions had been answered and the project officer was satisfied that the subjects fully appreciated the requirements of the study informed consent was obtained.

The very small differences in the proportions of tooth surfaces covered in various amounts of plaque were not calculated to be statistically significant. As in all clinical research it is the clinical significance which is of prime importance. No attempt was made in this study to measure clinical parameters or to assess the efficiency of the various toothbrushes by means of clinical signs of gingival inflammation. It is not felt that the small differences in the findings from the three toothbrushes tested would be clinically significant and the period of brushing was considered too short to accurately measure any changes in clinical parameters. Likewise the plaque accumulation phase was too short after each brushing period to produce clinical signs of inflammation in all subjects [2].

Plaque was assessed in a qualitative manner only. No microbiological methods were employed to investigate any possible shift in the spectrum of micro organisms present. Such investigation may well be important particularly in correlating microbiological finding with clinical findings such as gingival bleeding indices.

The results of the study in *Table 3* indicate that the plaque score following the first brushing period was never as low as the control plaque score. It is suggested that this is due to the subjects not being used to a new toothbrush and hence the feeling of a solid dense and less flexible cleaning aid may result in the subjects not applying the same degree of pressure against the teeth during brushing with a consequent reduction in the efficiency in plaque removal. As the subjects became used to the feeling of new toothbrushes they gained confidence and brushed more effectively in the subsequent brushing periods.

It is suggested that the use of a suspension design may reduce the pressure with which the toothbrush filaments are applied to the tooth surface particularly interdentally. Hence the plaque removal efficiency of a suspension design toothbrush may be reduced.

The in vitro work[3] using plexiglass models simulated plaque and mechanically-driven brushes concluded that the suspension system is incontestably superior to the conventional toothbrush for penetration into spaces between teeth. Such a conclusion is inappropriate in view of the total absence of teeth in their methodology. The work of this study is the only clinically applicable data available on this toothbrush design to date.

CONCLUSIONS

Neither the suspension toothbrush nor the non suspension toothbrush were found to confer any additional benefit in terms of plaque removal in this study when compared to a toothbrush of conventional design. Furthermore no difference could be found in plaque removal efficiency between suspension and non suspension toothbrushes.

RECOMMENDATIONS

In view of the very small differences in plaque removal ability of the toothbrushes tested it would be necessary to carry out a larger study if statistical significance was to be proven.

Although there was no statistical difference in the efficiency of plaque removal between the three toothbrushes compared there may be a quantitative or qualitative change in plaque which was not detected by using a plaque score as a parameter for assessment. In view of the sensitivity of gingival bleeding as a sign of gingival inflammation it is recommended that gingival bleeding indices be used in any further studies to supplement plaque scores as parameters for assessment.

In addition to assessing gingival inflammation in any future investigations it is recommended that qualitative microbiological analysis by culture techniques be additionally employed. By the use of quantitative (plaque index) and qualitative (culture techniques) techniques supplemented by gingival inflamma

[illegible] Smith (gingival indices) [illegible] [illegible] Clinical importance will be recorded during such a trial comparing active suspension and inactive suspension and conventional toothbrushes

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Travelling Fellowship Report: Vascular Trauma in America, May 1992

A J Walker

(Published with kind permission of the Editor of the Bulletin of The Royal College of Physicians and Surgeons of Glasgow)

Travelling backwards to America is novel especially when taking off and landing. Such however is the way that all personnel sit when flying on military aircraft decreasing the risk of crash trauma The Royal Navy were kind enough to sponsor my RAF trans-Atlantic flight to Washington DC which lacked the in flight entertainment but was otherwise much as any other The Royal College of Physicians and Surgeons of Glasgow and the Ethicon Foundation were also graciously sponsoring my internal travel and accommodation costs

Having an interest in military vascular trauma and in temporary shunting for lower limb vascular injury I had been invited by Professor Norman Rich the doyen of military vascular surgery to visit several centres in America These all specialised in trauma care, including vascular

On arrival in Washington DC I got over the jet lag spent a day sightseeing and flew on to Houston Little was I to know that this was Mothering Sunday in America and that everything closed after lunchtime! I passed a very quiet night living off food from the automat The following day I joined the morning rush-hour to arrive at Ben Taub General Hospital at the Texas Medical Center This is the major trauma centre for Houston and Harris County serving 3 5 million people It is only one of over 30 medical institutions located in the same area of Houston but is State funded and so more like an NHS hospital in concept

Dr Ken Mattox is the dynamic Chief of Surgery at Ben Taub and Professor at Baylor College of Medicine He has been instrumental in developing the hospital and obtaining public funds to maintain its trauma service Trauma care does not generate income in America and is often unwanted by private practitioners and hospitals It falls on state institutions to provide this service mainly to those without healthcare insurance I toured the hospital with Dr Mattox The Emergency Room (ER) is reached through the 'back door where the paramedic waggons arrive The first person you encounter is an armed security guard—violence and guns are a way of life in Houston The ER is manned by a 3rd Year Resident who is confident enough to open a chest or repair the great vessels Theatre is only a 12 second elevator ride away from the ER. This is a surgeon's hospital! Behind the ER is a holding area which fills as the day progresses and although designed for about 30 beds often holds over 40—patients being packed in like sardines in a can! Blocked beds are not just a British problem

I spent the night in the ER with Dr Jim Shoptan who felt disappointed for me that he had in the 24 hours only admitted five gunshot wounds one for lateral repair of the iliac vein For him it was a quiet duty I rode with the paramedic supervisor in his patrol vehicle for a couple of hours and visited the main fire department dispatch control to the town They

Surgeon Commander Walker is currently appointed to Royal Naval Hospital Plymouth

all call on any of 80 fire and paramedic stations at any one time to attend incidents in Greater Houston They too apologised to their British visitor that this was a quiet night Come back on Saturday they said

I left the 90 degree temperature of Houston for mile high Denver Colorado On arrival at Denver General Hospital I asked for Dr Moore Which one? was the reply The Moore family supply several members of the surgical fraternity in Denver Dr Gene Moore is Chief of Surgery and heavily involved in trauma research of all types A meander through his several hundred publications since arrival in Denver testifies to this In many his brother or other family members are co authors

Denver General is also State funded and the major trauma center in Denver although there are lesser institutions During my night in the ER there we prepared to open the chest on a casualty from a major incident but as the tension rose we had a call to say he had been taken to another hospital The ER team stood down knowing that the opportunity to test their skills in cardiac trauma would be called upon all too soon I was impressed by the rapid way that everyone from junior nurse to senior resident all knew what to do and where to be without any fuss The equipment was quickly laid out and all were standing ready in a matter of a couple of minutes even the critical pastoral carer (the chaplain)

As ever when visiting the night was quiet and I had only the satisfaction of being guest on the early morning ITU round and discussing the trans atlantic view on treatment of the previous days injured Great respect was paid to British skills of observation and communication with patients but the consensus was that we were still too conservative in our management and too slow to act

I left the snow capped Rockies and returned to Washington DC where I was to spend a week at Washington Hospital Center (MedSTAR) My liaison was C Gage Oschner a consultant surgeon at MedSTAR and a Commander in the U S Naval Medical Service He is attached full time to MedSTAR while also holding a teaching appointment at the Uniformed University at Bethesda Trauma and surgical critical care is run by Dr Howard Champion an Edinburgh Fellow who emigrated to America and is now a national adviser in his field

MedSTAR is one of Americas 10 best trauma centers serving a population of 4 million in the Mid Atlantic region It is a major trauma facility within a larger hospital complex in north west Washington It is served by two heliports which can take up to three flights at a time and from which there is direct entry into a major resuscitation and assessment area It is not casualty as we know it but is designed to receive and resuscitate patients suffering from shock or major trauma All too often this means gunshot wounds although major car wrecks bring their toll of injury too Three trauma teams provide 24 hour multidisciplinary expertise in all areas of emergency critical care Teams consist of two attending trauma surgeons (consultants-in residence) a trauma fellow (senior registrar) a senior surgical resident and additional house staff There are residents attached from the Walter Reed Army Medical Center and Bethesda Naval Medical Center enhancing the military input and allowing military surgeons to gain experience with major trauma

I was attached to Dr Oschner for my stay During a 24-hour admission period we admitted three gunshot wounds and several others from road traffic accidents. A 17 year old was brought in by ambulance with three gunshot wounds to head neck and chest He had been shot for dealing in crack on somebody else s patch He had $100 (£55 60) worth on him A rapidly inserted underwater seal chest drain was sufficient to deal with the chest problem as there was little bleeding The other wounds had caused a dense hemiplegia X-rays and emergency angiograms revealed that the common carotid and vertebral arteries were damaged on the same side as the head wound where the bullet had not apparently crossed the midline Would revascularising the neck cause further intra cerebral problems, or would ligation worsen the cerebral damage? I was asked my opinion and mindful that the first reported successful carotid ligation was by the surgeon of HMS Tonnant in 1803 I opted for the naval option of ligation The wound was explored the major nerves appeared intact there was no tracheal damage the vertebral artery was located with difficulty deep in the wound a damaged thoracic duct was ligated and there was a through and through ragged wound to the common carotid artery The vessel ends were resected a PTFE graft was inserted and flow was restarted this despite the risk of artificial material in dirty wounds When the neurosurgeons had then debrided his head wound and closed the dura he returned to ITU I am pleased to be able to report that grafting did not

trouble his cerebral damage and that I [illegible] slowly improving on ITU when I had to [illegible] home.

A day was spent at the F Edward Hebert School of Medicine at the Uniformed University of the Health Sciences at Bethesda. This institution is 20 years old and prepares young men and women for careers as regular Medical Officers in the uniformed services. This includes the Army Navy Air Force and the US Public Health service. Professor Norman Rich welcomed me and we spent a profitable period discussing aspects of vascular trauma care arterial and venous. He was able to draw from his vast experiences in Vietnam and from his follow up programme with the Vietnam veterans' vascular registry. This Registry is a comprehensive long term follow up of all vascular injuries in the Vietnam war. There has never been such a careful review of battle injury and it is used to determine the outcome of treatment regimes in military vascular injury. Professor Rich was interested to hear of my research with temporary vascular bypass shunts but reserved judgement on their place in military surgery.

My visit was now complete and I returned facing backwards again to the UK. In a short period I had gained an insight into the American way. They are aggressive, rapid and committed totally to trauma care in the major centres. It might have been interesting to see how it was done out of town in the smaller hospitals or less organised States. I suspect that there are two standards in some places. The infrastructure to set up major trauma centres on the American scale is vast. Staff and equipment is dedicated solely to trauma. This means five consultants resident programmes large well staffed ITUs and full back up with neurosurgeons cardiothoracic surgeons orthopaedic surgeons and intensivists available night and day at any hour in the one institution. The control of hospital support is also impressive. Helicopter ambulances are the norm to move the injured rapidly in busy traffic snarled cities or to transfer those from out of town. All the major police forces have several and so they are an accepted method of transport in the city complementing the road ambulance service. One of the first hospital planning decisions is where to put the heliport. Would all this be necessary if they tightened the gun licensing laws?

The management of trauma is controversial. Dr Marlow was investigating resuscitation techniques in Houston. He postulated that pre hospital resuscitation was not so necessary and that short-term hypovolaemia and hypotension was preferable to over-transfusion. Patients in hypovolaemic shock were being randomised to receiving IV fluids or not prior to arrival in hospital. Dr Moore at Denver was involved in studies into the benefit of very early feeding for the seriously injured if necessary by jejunostomy. Drs Champion and Oschner in Washington were prepared to insert artificial graft material in a potentially dirty wound.

I saw a lot learned even more and hopefully my hosts gained some little crumb from my visit. At all times I hope I was a good ambassador for the Royal College of Physicians and Surgeons of Glasgow and for the Royal Navy to both of whom I owe much thanks for their support.

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The management of alcohol abuse in the Royal Navy

S Micklewright

(An article based on a paper presented to the Tri Service Psychiatry meeting at the RAMC College Millbank London on 15 October 1992)

Abstract

This paper offers a brief outline of the current Royal Naval policy on alcohol abuse. It starts by setting the Navy's problem in the context of a widespread social phenomenon. Attention is then drawn to the peculiar stressors of a military environment which may contribute to the development of problems in certain individuals. From this introduction the practical implications of the policy are made explicit. This has two main strands: education and dealing with problem drinkers. The use of education to prevent the development of alcohol related difficulties at a general whole force and specific divisional/management level is described. The identification and management of problem drinkers is also outlined. This is followed by a discussion of the policy which concludes with the listing of its strengths as perceived by its operators.

INTRODUCTION

A recent report has suggested that over 30 000 people die prematurely in the UK every year as a result of alcohol-related problems. In 1990 one million working days were lost as a result of strikes but it has been calculated that one and a half million were lost as a result of alcohol related problems.[1]

It is therefore not surprising that a general social problem such as alcohol should have some effect on the Armed Forces. While many members of the RN might like to regard themselves as a breed apart it is inevitable that the attitudes and behaviour of the wider society will penetrate to some extent. In addition to sharing in general social patterns the RN inflicts its own peculiar pressures on its personnel. The separations long hours variable conditions and geographic mobility of service life can all act as stressors which may be reflected in alcohol abuse behaviour. Some of these experiences may be so extreme as to be outside the normal ranges of human experience in modern society eg combat coping with natural disasters etc.

Perhaps the most important factor in creating a drink problem in the RN is quite different from the above. When Winston Churchill described the traditions of the Royal Navy as 'Rum Sodomy and the Lash' he was only partially joking. Leaving aside the latter two alcohol has always paid a huge part in the folk image of the sailor and his own estimation of himself. The social life of the RN is a subculture based around cocktail parties mess dinners beer rations and runs ashore. For any individual entering this world alcohol is constantly present. Social life revolves round the bottle the teetotaller is regarded with suspicion. Drinking is not just an available pastime it is almost a qualification for sub-cultural membership.

It is not surprising in this permissive atmosphere that certain individuals should respond by drinking excessively and developing alcohol related problems. Traditionally while disciplinary misdemeanours have been viewed dimly tolerance of and even collusion with heavy

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drinkers has been a feature of service life. Open recognition that someone has an alcohol problem occurs when the individual's colleagues and superiors are faced with gross physical, psychological and social damage. Such late recognition has a number of adverse effects:

1. Poor prognosis
2. Waste of manpower and resources
3. A tendency to regard the problem drinker as a hopeless case and in some way morally deficient, eg. he cannot hold his drink, he's a basket weaving case. Such attitudes help to relieve the anxiety of the surrounding drinking culture.

In the days of Royal Victoria Hospital, Netley, the courses offered for service problem drinkers were long, in-patient based and highly staff intensive.[2] Despite this the results were at best mixed. Since the closure of Netley there has been a shift in the emphasis of alcohol problem management in the RN. This has involved changing the main locus of intervention from a policy of reacting to chronic, damaged drinkers to the early identification and treatment of alcohol abusers. This course of action is not entirely unsupported by other sources. Chick *et al*[3] in Edinburgh have produced studies supporting the effectiveness of brief intervention in early drinking problem populations.

As it stands today, the RN policy on alcohol abuse has a number of strands. The first of these is a policy of education to raise levels of awareness of alcohol problems, the second is an early, brief intervention strategy for identifying problem drinkers.

GENERAL PREVENTION

The emphasis on education began in the late 1970s when psychiatrists and nursing staff from Plymouth and Portsmouth started to give lectures on alcohol abuse to new entries and management courses. This was of course secondary to their main treatment role. It was then decided that a more systematic approach was required.

Since the mid-1980s the RN has operated the RN Alcohol Education Team.[4] This consists of two non-medical senior ratings. Their brief is to deliver lectures in ships and establishments at home and abroad on the dangers of excessive drinking. Their aim is the promotion of sensible drinking habits. All new entrants at Raleigh, Dartmouth and Lympstone receive a lecture. The desirable follow-up period is a repeat lecture every two years.

SPECIFIC PREVENTION

This consists of raising the levels of awareness of alcohol problems and dealing with identified individuals in the divisional/management context. This is undertaken at the Royal Naval Divisional and Management School at Whale Island, Portsmouth. Lectures are delivered as follows:

1. Alcohol Education Team lectures to Divisional Officers/Senior Rates.
2. ATU Charge Nurse lectures to Heads of Departments.
3. Consultant Psychiatrist lectures to Commanding Officers.

EDUCATION/TREATMENT OF PROBLEM DRINKERS

The RN policy in this field has involved movement away from seeing excessive drinking as purely a medical problem. The emphasis on alcohol abuse as a primarily executive and managerial problem is enshrined in Queen's Regulations for the Royal Navy.[5] Apart from outlining the general responsibilities of those in authority regarding excessive drinking, it also outlines the management of the problem drinker.

Identification of the problem drinker may take place in many contexts. Doctors and social workers recognise problems, and self-referrals occur. Most commonly however, the identification is made by the individual's own divisional system. The most frequent reasons for identification are alcohol related disciplinary offences, debt, poor work performance and personal difficulties, all with a background of excessive drinking.

The first stage of dealing with the problem is an informal warning by the divisional officer or head of department of the consequences of continued excessive drinking. Measures such as stoppage of alcohol ration and withdrawal of permission to live ashore may also be considered.

The individual should then be referred to the Basic Education Course at either Portsmouth, Plymouth or in Scotland. This is a compulsory one-day course concentrating on the dangers of alcohol abuse. The main input is by the AET although other agencies such as the RN Provost Marshal and NPFS are also involved. ATU

staff attend to provide assessment and individual counselling to the course members

At the end of the day the participants are offered the opportunity to volunteer for the Extended Education Course This is classified as treatment and no-one can be compelled to attend The course lasts for a week and is conducted at the Alcohol Treatment Unit at RNH Haslar on a day patient basis Groups are comprised of 4-6 patients with one or two therapists The emphasis of the course is on using group dynamics to explore the individual's personal world in relation to their abuse of alcohol The psychiatric community staff in the Plymouth area run a weekly alcohol support group for personnel who feel the need for support prior to following or as an alternative to the EEC

Identified problem drinkers who either refuse the EEC or complete it are returned to their ship or establishment Medical downgrading is a comparatively rare procedure The process of the BEC and EEC strongly emphasise the point that continued excessive drinking is a matter of personal choice for which the individual must accept the consequences Further problems may result in the person's administrative discharge from the RN with the loss of pension rights benefits etc accumulated during service Medical discharge on the grounds of continuing alcohol abuse is extremely rare

DISCUSSION

It has to be said that the success of this strategy is presently based on largely anecdotal evidence but follow up of patients by the ATU and consultant psychiatrists seems to indicate a majority of favourable outcomes

From the point of view of staff resources only one person is employed full time in the ATU in the role of alcohol abuse prevention and management The AET comprises two people The other agencies such as the consultant support and other contributing services are part-time This relatively low level of staffing reflects the shift of emphasis into non-medical and community based methods of dealing with alcohol abuse

One criticism that might be levelled at the programme as it stands is that it appears to offer little to the chronic dependent abuser This is best answered by pointing out that the strategy is aimed specifically at preventing the development of such problems Its success may be reflected in the fact that personnel exhibiting physical signs of alcohol dependency as a presenting feature dropped from 10% to 1% of total patient numbers between 1978 and 1991 Nevertheless it is recognised that officers and SNCOs may be able to drink excessively for long periods without detection due to collusion or misplaced loyalty This problem is highlighted in the management presentations

CONCLUSION

It is probably best to finish by summarising the strengths of the current RN programme as perceived by its operators

First early intervention prevents the escalation of abuse to more serious levels Secondly the period of education and treatment is comparatively brief This encourages commanding officers and managers to refer patients as the person is not lost to the ship or establishment for any length of time Thirdly by simplifying the system referral rate is increased Lastly the broadening of involvement of agencies beyond the medical services and the emphasis on education have served to increase the general level of awareness in the RN about the problems of alcohol

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Malta and the British navy: the medical connection during the nineteenth century Part II. Some medical practitioners of note

C Savona-Ventura

INTRODUCTION

In the first part of this paper published in the Winter 1992 issue of the Journal we learnt something of the history of the naval hospitals on Malta with special reference to the Royal Naval Hospital at Bighi This period also saw the arrival of a number of British medical practitioners Some of these are noteworthy either because of their contribution to local medical and social history or because of their contribution to the navy and to medicine

THE MEDICAL PRACTITIONERS

The first senior physician in Malta Dr Leonard Gillespie (1758–1842) was appointed in 1804 and occupied the post until January 1805 when he became Physician to the Mediterranean Fleet after Dr John Snipe Dr Gillespie was born at Armagh and studied in Dublin He joined the Royal Navy as second mate in 1777 After a short break in service he applied for a ship in 1786 He was appointed to the *Tan guard* and then to the *Ruthorse* and was present at the Battle of the Glorious First of June in 1794 The following year he received his medical degree from St Andrew s by proxy and in 1798 was appointed to take charge of the hospital on Martinique His diaries and letters give vivid information about daily life on board Nelson s flagship the *Victory* He retired from service in August 1805 and died in Paris at the age of 83 [1]

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Dr John Snipe was Physician to the Mediterranean Fleet at the turn of the eighteenth century He paid careful attention to the general health of the ships crews and the high standard of health enjoyed during the long blockade of the French fleet at Toulon may be attributed to him He was responsible for the instructions to captains for the issue of bark mixed with wine before any parties were despatched ashore He also desired seamen to wear shoes in order to avoid ulcerated scratches Dr Snipe came to Malta in 1803 at the behest of Nelson with the express purpose of finding a suitable locality for the proposed new naval hospital and subsequently suggested the Villa Bighi site At the beginning of 1805 Dr Snipe was transferred to the Royal Naval Hospital at Haslar [1]

Another medical practitioner who had connections with Nelson was Surgeon Michael Jefferson who had attended the admiral during his convalescence following the loss of his arm Jefferson subsequently accompanied Nelson to the Mediterranean in the *Vanguard* and treated him when he was injured on the forehead in 1798 Jefferson was later posted to the Malta hospital but because of misconduct was passed over in subsequent appointments In 1804 Nelson wrote Mr Jefferson got on by my help and by his own misconduct he got out of a good employ and has seen another person at Malta hospital put over his head He must now begin again and act with much more attention and sobriety than he has done to ever get forward again but time may do much and I will rejoice to hear of his reformation [1,2]

Surgeon John Gray was the first Naval

surgeon to the Naval hospital housed in the former slave prison at Valletta to which post he was appointed on 25 November 1803. He was replaced by Surgeon John Allen who was Principal Medical Officer of the Naval hospital until 1827. Allen had been appointed surgeon to the Navy in 1784 and served under Lord Nelson. He was renowned for his treatment of gunshot wounds and for the treatment of fevers. It was said of him that his dexterity in using his knife was equalled by what is of equal importance, his knowledge of discerning when not to use it. He died in Malta at the age of 94 years on 14 January 1849 and was buried in the Msida Bastion Cemetery.[3,4]

Dr Joseph Marshall, together with Dr John Walker, was instrumental in introducing smallpox vaccination to the Islands. Soon after Edward Jenner described smallpox vaccination in 1798, the British Government took steps to vaccinate its naval and military personnel. In July 1800 Dr Marshall and Dr Walker left England with a supply of Jenner's variolu vaccine for the forces in the Mediterranean. The first recorded naval vaccination was carried out by them on 11 men from HMS *Endymion* at Gibraltar in September 1800. By the time they reached Malta, smallpox had broken out in the fleet. The Governor of Malta, Sir Alexander Ball, ordered all naval personnel based in Malta to be vaccinated. Dr Walker eventually departed for Egypt in December 1800, while Dr Marshall remained in Malta to enable the vaccination of Maltese children to be carried out. A number of these were vaccinated in the presence of Dr Luigi Carnana, the Protomedico and Dr Lorenzo Cassar, the Principal Physician to the civil hospital. In addition an Italian translation of Jenner's book was published in Malta for health propaganda reasons. Dr Marshall was later to be appointed Physician Extraordinary to George III.[4,7]

A contemporary of Dr Marshall was Revd Dr William Pargeter (1760–1810) who graduated from Marischal College, Aberdeen in 1786. Dr Pargeter was one of the early reformers in the management of the insane in England publishing in 1792 his Observations on Maniacal Disorders, wherein he advocated that the physical restraint of mental patients was unnecessary. In 1795 he abandoned medicine and joined the Royal Navy as a chaplain. He was present at the Battle of the Nile in 1793 on the *Alexander* and subsequently served in Malta as Chaplain to the Garrison. He retired from the navy in 1802 and died in Oxfordshire in 1810. Despite being the first British psychiatrist with modern views to come to Malta, he probably had little influence on instituting humane treatment of the insane which was eventually introduced by Dr Thomas Chetcuti in 1838.[7]

A naval physician who significantly influenced naval administration was Dr (later Sir) William Burnett. Dr Burnett was born at Montrose in 1779 where he was apprenticed to surgeon before entering the Navy as surgeon's mate in 1795. He served at the Battles of St Vincent, the Nile and Trafalgar before being appointed Physician to the Mediterranean Fleet in 1810, a post he retained until October 1813. He attempted to elucidate the nature and aetiology of the various fever epidemics which affected seamen and civilians in the British Naval stations in the Mediterranean. In his account published in 1816 Burnett describes a number of fever epidemics which occurred in British ships and records for the first time the clinical picture of undulant fever. He returned home in 1813 to deal with a typhus epidemic in the prison hulks at Chatham. Burnett's abilities were more those of an administrator than of a scientist or literary man. He rejoined the Navy in 1822 as an assistant to the Medical Commissioner Dr John Weir, replacing him in 1832. Under his direction a number of revolutionary changes were introduced in the administration of the department.[4,8]

Sir Thomas Spencer Wells was born at St Albans, Hertfordshire, on 3 February 1818. He was interested in natural science as a boy and later this led to his study of medicine. He began as a pupil of one Sadler, a surgeon of Barnsley, Yorkshire. In 1832 Wells went to Leeds where he attended lectures given by the elder Teale and the second Hey, while also serving as assistant to a local surgeon. The following year he interned at St Thomas's Hospital, London and two years later (1841) he earned his MRCS (London). He then enlisted as a surgeon in the Royal Navy and served for six years in the Naval hospital at Malta from 1841 to October 1847 after which he transferred to HMS *Rhin*e. As a result of the new charter of 1843 which permitted the Council of the college to create further fellows, and Sir William Pancu's intervention with the College, Wells was elected Fellow of the Royal College of Surgeons of England in 1844. He was also enrolled as a member of the Maltese Medical Society of Encouragement. In 1843 he published two articles on plague and quarantine. During his stay in Malta he was instrumental in the intro-

duction of anaesthesia He initially devised an apparatus for the administration of ether and attempted this in a case of partial amputation of the hand His apparatus was only partially successful and so Wells brought a Hooper s inhaler from England which was used successfully on 6 March 1847 Shortly afterwards he published an account of a case of hydrophobia in a Maltese woman on whom ether inhalation was unsuccessfully tried in an attempt to abolish the muscular spasms He then published a further paper on quarantine and in 1846 a report of cases treated in the Royal Naval Hospital Malta during 1843 and 1844

While serving as surgeon on the *Medusa* in the Mediterranean in 1852 he remarked in his Journal on the incidence of tuberculosis in sailors, soldiers and civilians as identified from post mortems performed in Malta between 1842 and 1852 Wells also made an urgent plea to the Admiralty for improvements in ventilation to the ship but this was of no avail Although still attached to the navy in 1853 he established his practice in London devoting most of his time to obstetrics and ophthalmic surgery The following year he was elected to the staff of the Samaritan Free Hospital for Women and was also chosen as editor of the *Medical Times* and *Gazette* In 1857 Wells performed unsuccessfully an ovariotomy for the first time upon a patient of his own his second ovariotomy in 1858 was however successful By this time he had become lecturer in surgery at the Grosvenor School of Medicine which in 1865 became the St George s Hospital medical school During the Crimean War Wells served as an army surgeon to the British Civil Hospital in Smyrna and later at Renkioi In 1877 he was Hunterian Professor of Surgery and Pathology at the Royal College of Surgeons of England In 1878 he resigned his active post at the Samaritan Hospital and became consulting surgeon He became vice-president of the Royal College of Surgeons in 1879 and four years later president The title of Baronet was conferred on him in 1883 He died as a result of a second attack on apoplexy while on a short journey to Cap d Antibes on 31 January 1897 He had sustained his first attack two years previously resulting in a mild paralysis which affected his speech until his death [14]

HMS *Theseus* later lectured in Maltese medical history in May 1903 through its association with a number of cases of lead poisoning among persons engaged in bread making An inspection of all the bake-houses in Malta showed that wherever the thickly painted timber from the recently dismantled ship had been used as fuel for heating the ovens symptoms of lead poisoning were evident Lead was also discovered in the bread supplied to the public from these ovens and consequently the use of this timber as fuel was discontinued [15 16]

The first surgeon to operate in Malta under ether anaesthesia administered by Dr Spencer Wells was Dr William Colborough Watt who was appointed Deputy Inspector of Bighi Hospital on 25 March 1843 Watt was similarly admitted as honorary member of the Società medica d incoraggiamento in June 1842 He died on 20 August 1848 at his residence in Kinella Bay close to Bighi and was buried in the hospital cemetery Watt served for over 30 years with the Royal Navy and distinguished himself on the Burmese War in 1825 as Chief Naval Medical Officer [17]

Dr William Martin was another contemporary of Dr Spencer Wells He was appointed to the post of Principal Medical Officer at Bighi in 1840 and by his eminent ability in his profession and by the kindness and urbanity of his manners he had gained the affection of the whole squadron He had in 1837 been awarded the Gilbert Blane Medal for his submitted Journal while serving in the *Jaseur* in 1831 His career was tragically cut short when he was killed on 6 March 1843 After an official visit to Rear Admiral Sir John Louis at Vittoriosa, the sentry on duty shot Dr Martin in the back, wounding him in the kidney and intestines Despite prompt medical aid he died after 40 minutes The sentry John Naylor of the 88th Regiment gave himself up At his trial a plea of insanity was entered the jury all found him guilty of murder except one member who expressed the opinion that the accused was indeed insane Naylor escaped capital punishment but was condemned to the galleys for life and to labour in the public work with a chain Dr Martin was buried near his wife in the burial ground attached to Bighi hospital [18]

(To be continued)

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Leptospirosis

Emma J Lacey

INTRODUCTION

In the autumn of 1991 Surgeon Sub-Lieutenant Lacey undertook an elective period at HMS *Tamar* Hong Kong. The following extract from the account of her elective period is here published as it is thought to be both of interest to our readers and an example to our junior colleagues

CASE REPORTS

While I was working in HMS *Tamar* an interesting outbreak occurred Four servicemen presented separately with symptoms of fever tiredness headache nausea and weight loss, all requiring hospital admission and some going on to develop clinical weakness and meningism

Case 1 A 26-year old previously healthy serviceman presented on 28 October 1991 with influenza-type symptoms and strange 'out of body' experiences On examination he was pyrexial (38°C axilla) and tachycardic but with no other positive physical findings. He was initially managed as having a 'flu like illness and was sent home for bed rest and to return if his condition did not improve

He presented four days later with worsening of his symptoms, and associated nausea and vomiting with a severe headache On examination he appeared unwell pyrexial dehydrated and there were now signs of meningism He was therefore referred to the British Military Hospital (BMH) where he was admitted under the care of the physicians No working diagnosis was reached, so he was treated initially with rehydration therapy and further investigations were instigated

A provisional diagnosis of leptospirosis was made after an additional history was given of participating in mud wrestling on the island of Lantau He was treated with IV benzylpenicillin his recovery was slow as his illness followed a relapsing course but he was discharged 10 days later to GP care Diagnosis was confirmed by positive serology

Case 2 A 31-year old fit and active serviceman presented on 30 October 1991 with a "flu-like' illness with symptoms predominantly of muscle pain and weakness in all four limbs more pronounced in the lower limbs On examination he was unwell pyrexial hypotonic and had mild non-specific impairment of gross neurological functions such as walking He also had hepatomegaly He was referred to BMH

He was admitted under the physicians care for further investigation as they were puzzled by his case While in hospital he developed a meningitic-type picture and was treated with IV benzylpenicillin On close questioning it was discovered that he had also taken part in mud wrestling on Lantau Serological examination for IgM were performed and urine was sent for culture He responded well to treatment and was discharged home after six days.

Case 3 A young woman of 22 presented on 26 October 1991 with a single attack of syncope She had previously been well and pregnancy was excluded on history On examination she was drowsy pyrexial hyper reflexic and had an erythematous rash She was admitted to the six-bedded low-dependency ward for observation She remained well throughout the day and was discharged home She represented that evening with another syncopal attack accompanied by vomiting and worsening pyrexia She was admitted to BMH where she was monitored for

Acting Surgeon Lieutenant Lacey is a Hause Physician at RNH Haslar

several days with no diagnosis being reached. During admission she developed proteinuria so her renal function was monitored. While an inpatient at BMH she met team mates from the mud wrestling team (Cases 1 and 2) both of whom had leptospirosis and the connection was made. She recovered uneventfully. Serological results confirmed the diagnosis.

Case 4. The fourth case presented on 31 October 1991 after hearing of the others admission to hospital. His symptoms were non specific but he told the GP of his involvement in the mud wrestling. On examination he was pyrexial and he had striking exophthalmos, he was also tachycardic. Discussion with the physicians at BMH led to his admission to investigate his possible thyroid disease. He remained more well than the others but following a course of penicillin his eye changes disappeared and again the diagnosis of leptospirosis was confirmed.

DISCUSSION

Leptospirosis is a rare disease in the UK and it would be very unlikely for a GP to see a single case of it during his lifetime. It is a much commoner disease in the Third World where sanitation is poor and outbreaks have been reported throughout South East Asia.

Caused by a spirochaetal organism it is a bacterial illness which is responsive to penicillin. The disease is a zoonosis transmitted via infected water from animals such as rats although transmission from other species has been reported. The incubation period is usually 4–21 days. The outbreak of leptospirosis at HMS *Tamar* affected four individuals all of whom were active servicemen and keen sportsmen and kept in very good health. All four patients had been members of the HMS *Tamar* mud wrestling team and 14 days previously had taken part in a mud wrestling competition this connection was not made at the initial presentation. Mud wrestling is a fun sport which takes place once a year on the island of Lantau the mud used being notoriously unpleasant and unhygienic.

The disease itself has a varied presentation producing a wide spectrum of symptoms and signs although typically a biphasic illness it may be subclinical or may be a severe disease causing meningism jaundice with hepatosplenomegaly and may even lead to death. All four patients differed in their presentation however all were pyrexial unwell anorexic and nauseous. One had tender hepatomegaly a second had meningism another had mild renal impairment and the fourth had exophthalmos. Such a broad range of presentation is typical of leptospirosis. When the three more seriously ill patients were transferred to BMH the provisional diagnosis was of a viral illness.

The diagnosis is often made from clues in the history usually occupational or recreational activities that lead to exposure to the organism. It used to be commonly seen in the Irish workers of Aberdeen as cuts in their hands allowed the entry of water contaminated by rat urine which contained leptospirochaetes. In this case the diagnosis was only entertained when the patients met each other and realised the connection.

The investigations which lead to a diagnosis of leptospirosis are a non-specific polymorphonuclear leucocytosis deranged liver function tests suggestive of an intra-hepatic pathology and more specifically blood and urine cultures and observing a rising titre of IgM antibodies in the serum. In this case the IgM antibodies were positive for *L autumnalis* one of the commoner sub-types.

Treatment is classically with rehydration and IV benzylpenicillin recovery often follows a relapsing course but is usually complete. In this series all the patients went on to make a complete recovery.

Further investigation were carried out at the site of the mud wrestling competition and it was found that raw sewage had leaked into the water used to wash the contestants down after the match. Not surprisingly this information made its way into the local press.

J roy [illegible] 1993 79 39 44

Mission Impossible—an account of the Royal Naval Medical Staff School challenge for the television programme 'You Bet'

P R Wellings

Summary

London Weekend Television transmits a weekly programme entitled 'You Bet' which invites members of the public undertake challenges the outcome of which are bet on by a panel of celebrities and a selected section of the studio audience. During Christmas 1992 a special Armed Forces edition was screened and instructional Staff from the Royal Naval Medical Staff School (RNMSS) took part. An account of the lead up to this event and the subsequent success of the challenge is discussed in what is a outstanding public relations exercise for the Royal Naval Medical Branch.

INTRODUCTION

In June 1992 the Director of Public Relations (Navy) (DPR(N)) on behalf of London Weekend Television (LWT) invited suggestions for potential challenges for a special edition of the weekly television programme 'You Bet'. The programme was intended to be transmitted during peak viewing time over the 1992 Christmas holiday period and would consist entirely of Armed Forces Personnel. The estimated audience was considered to be in excess of 15 million and was felt to be a one off Public Relations exercise of tremendous importance for HM Forces.

The training staff at the RNMSS were keen to submit a challenge and had agreed among themselves that a casualty handling exercise on board the Harbour Training Ship HMS *Arrow* would be visually exciting and typify the work of the medical branch. The drawing board had been idled when Warrant Officer Medical Assistant (WOMA) Chris Henry approached the Executive Officer (XO) of the school for tacit managerial approval. Necessarily the XO was somewhat sceptical feeling that the challenge would not get beyond the application stage because the show was more likely to feature the more glamorous areas of the service such as Naval Aviation or Field Gun. Furthermore if it was accepted it would have to succeed or at least not fail badly. Mr Henry was told that he should conduct a few feasibility runs and if he still considered the challenge possible to go ahead—subject to approval from the Officer in Charge. The following day the RNMSS challenge was passed to DPR(N) and thereafter promptly forgotten amidst the distraction of everyday work.

Just before Summer leave much to everyone's surprise a request was received from DPR(N) for the 'You Bet' Producer and some of her retinue to visit and discuss the possibility of staging the run. Two members of the team, POMA Robert (Tops) Turner and CPOMT(PD) Nick Woods, met the Producer and having explained the format and route of the challenge were delighted when it was considered suitable. The team were not aware at this time that the RNMSS challenge was the only dark blue submission accepted.

THE CHALLENGE

The challenge was based on a training exercise that Mr Henry supervises with every Medical

Lieutenant Commander Wellings is the Executive Officer of the Royal Naval Medical Staff School, RNH Haslar.

Assistant class passing through RNMSS—namely the transportation of a casualty on a Neil Robertson Stretcher from 5I Turbine Room to the Flight Deck on 01 deck. It is a routine evacuation procedure requiring the casualty evacuation team to pass through five decks and numerous hatches, and necessarily involves them having to ascend several steeply inclined ladders. If the ship is closed up for action stations with all hatches secured and clipped a trained team should be able to complete the passage in about 15 minutes. The initial RNMSS Challenge was to finish the exercise in five minutes which was later reduced to three following intensive training. The actual deadline however was finally set at only two minutes—considered by most people with any experience in this area to be an impossible target. Furthermore to participate in such a challenge requires supreme individual physical fitness (a loaded stretcher is very heavy), split-second timing to open hatches and negotiating ropes and faultless teamwork. A very high casualty is also a positive asset! All points considered the XO's initial scepticism appeared to be justified but he clearly did not fully appreciate the quality of the school staff.

THE TEAM (*Fig. 1*)

The team was led by Mr Henry a notorious rugby player who can fairly be described as stocky and very fit despite his advancing 40+ years. He was also the spokesman and carried the heavy (head) end of the stretcher. The other heavy end representative was Petty Officer Medical Assistant Bob Turner an accomplished First Aid Instructor and well known eccentric. The side and foot carriers were Chief Petty Officer Paul Barletta responsible for the overall sartorial appearance of the team, Chief Petty Officer Medical Technician (Pharmacy Dispenser) Nick Woods who acted as the negotiator between RNMSS and the strangely attractive LWT executive, Chief Petty Officer Medical Technician (Radiographer) Ian Athersmith responsible for exposure and team development and Petty Officer Medical Assistant Andy Blocke who as an experienced Royal Marine Commando rated the exercise as a pre-physical warm up. Last and physically least was the casualty—Chief Petty Officer Medical Technician (Nurse) Ian Gillespie who had a misguided faith in the caring and compassionate nature of his team colleagues but an obvious predilection for bondage.

TRAINING

It was appreciated very early on that if the challenge was to succeed it would involve a great deal of training, both to improve physical fitness and to perfect the timing and teamwork necessary. The school at this time was working to maximum capacity and staff could not be released for extraneous duties. This required all training to be conducted in the evenings and at weekends. The timings varied from 3 minutes 30 seconds to 2 minutes 15 seconds so the original time of 5 minutes was clearly achievable. However because of programming restrictions aimed at maintaining maximum audience attention the target was set at 3 minutes exactly. It should be noted at this point that the co-operation and assistance of the Commanding Officer and Ship's Company of HMS *Kent* was essential especially for the filming sequence and this was given willingly and enthusiastically.

THE RUN

The actual run was filmed on HMS *Kent* on Sunday 13 September 1992. The team paused as they were to the technicalities of television productions.. were amazed at the number of people and amount of equipment involved in such an event—especially the mobile galley and dining room which was used to its maximum capacity. The lighting and camera locations were particularly impressive as every foot of the run had to be lit and filmed. Throughout it was quite obvious that the ultimate cost was measured in many £ks—considerably in excess of the Surgeon Commodore's Travel Budget.

The only practice run allowed was completed in 1 minute 55 seconds. This was the fastest ever and prompted the show's Presenter Matthew Kelly to reduce the deadline to two minutes—much to the chagrin of the team who felt that this was pushing their luck just a little too far. Furthermore it was during this run where the casualty had found it necessary to fend off several bulkheads and hatch combings that it was considered essential that he wear a safety helmet in order to safeguard the ship's structure and fittings (*Fig. 2*).

It was at this time also that a popular myth about the show was laid to rest. It had been assumed that after so much financial outlay the TV Company would require a successful outcome—come what may. As a result the team offered to complete several runs which would enable the producer to screen the fastest only

Fig. 1 The team (from left to right) POMA Bob Turner CPOMT(N) Ian Gillespie CPOMT(R) Ian Abersmith Matthew Kelly from LWT WOMA Chris Henry POMA Andy Blocke and CPOMT(N) Nick Woods.

This however was not acceptable and only the run planned for that day was to be filmed Fortunately and despite a very generous lunch which left the team feeling less than ready the challenge was finally completed in 1 minute 59 seconds This was good enough and rated by the production team as excellent action television

THE SHOW

The actual show on 30 September 1992 was something of an anticlimax Because the challenge had already been completed the team were only required to do a walk on prior to the showing of the video and to join all the other competitors for the finale Unlike the other Service participants who still had to perform their challenges live in front of the cameras the RNMSS had no reason to be apprehensive As a result they were able to relax and fully appreciate the work involved in producing a major TV show

The instructions from LWT required the team to arrive at Shepperton Studios at 1430 change immediately into their best uniforms and to then stand around for several hours doing absolutely nothing As one team member remarked it was apparent that LWT s planning strategy was to get everyone in one place at the same time then think of a plan The Officer in Charge and the XO accompanied the team the OIC joining the team during the televised event and the XO acting throughout as the duty driver and officer responsible for the 40 enthusiastic and highly vociferous Medical Branch trainees who arrived later for the show

The afternoon was quite enjoyable and was spent watching the other teams rehearse their challenges and revelling in those that went

[illegible] lightly being manhandled [illegible] the boiler [illegible]

strong. Our sympathies however were with the RM Band who experienced considerable problems during rehearsals—fortunately this was knocked later in the show. The main problem for the RN contingent was that by the time filming began in earnest each challenge had been seen several times and the effort to maintain the spontaneous delight and rapturous applause demanded by the Director was a challenge in itself. The only real crisis was when a female floor manager was spotted wandering around in the front of stage area wearing full PQMA's uniform—completed by headphones clamped firmly over the cap. It could only be conjectured at the time that somewhere a PQMA was wandering around in the floor manager's frock. Needless to say it was considered prudent not to pursue this hypothesis further.

The highlight of the whole event and the reason why it was considered so important was the appearance of the trainees. It had been decided very early on that they would appear in uniform and in retrospect this was a wise choice as all other supporters were in plain clothes. For the usual security reasons they travelled in casual rig. Unfortunately there were no changing facilities for them on site so they had to change on the bus—a frustrating experience in more ways than one. However LWT had allocated a complete block of seating for RNMSS and every time the Navy was mentioned the cameras homed in on the uniformed trainees who responded appropriately and enthusiastically. The slight drawback was that the XO and CPQMA Birletta who were seated with the group were unkindly it was thought considered by the Director to bear a strong resemblance to the two old men in the Muppet Show.

On completion of the filming the team were generously entertained in the LWT hospitality area and thereafter transported to a very comfortable hotel for the night. It needs to be

emphasised here that the cost of the whole exercise to the public purse was absolutely nothing. Everything from the hire of the self-drive minibus meals and the hotel was funded by TWT

CONCLUSION

The fact that You Bet is a light hearted family show should not detract from the efforts that went into it or the PR benefits derived from it by the Royal Navy in general and the Medical Branch in particular. The challenge was ambitious required considerable personal [illegible] and showed the Medical Branch in an excellent light. The professionalism tenacity physical fitness and not last the humour of the Medical Branch Senior Rating was clearly evident. Similarly the frequent shots of smartly dressed Junior Ratings enthusiastically supporting their instructors and obviously enjoying themselves was priceless public relation material. The opportunity to advertise the Royal Naval Medical Branch to an estimated audience of 15 million during a major bank holiday at no cost—excepting moderate embarrassment to two senior Medical Services Officers—has got to be good value

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The Royal Naval Medical Library Service

M Rowe

HISTORY

The Medical Library at Haslar was established in 1827 by Sir William Burnett. Originally intended as a subscription library funded from medical officer's pay, it was in fact funded by the Admiralty from the first. The original library is largely intact as a closed access collection in the Medical Museum at Haslar and is available only on application to the Haslar Medical Librarian.

In 1986 the current Royal Naval Medical Library Service (RNMLS) was separated and housed in F Block at Haslar. A professionally qualified librarian was appointed who started to create a recognisable modern medical library until she left in 1989. A year later in 1990 the present Medical Librarian took up the post and has continued the growth of the services outlined below.

INTRODUCTION

The RNMLS is based on the Medical Library at Haslar which is manned daily from 08.30 to 17.00 by the author and his assistant, Mrs Sandra Morriss. The library is available out of hours via the Patients Services Centre in the hospital. There are also libraries at Stonehouse and Gibraltar, the former being manned by a professional librarian, Mrs Carol Hobbs, from Monday to Thursday each week. The library at RNH Gibraltar is accessible by approaching Matron at the Hospital. The RNMLS is not taken to include the INM Library at Alverstoke which is part of the same network but provides its own services.

All the libraries cater for medical and nursing staff and Haslar has a specific responsibility for providing services to Sick Bays ashore and afloat. Haslar Library is also the central coordinating point for Royal Navy loans, book and periodical provision and information retrieval services with the exception of the library at Stonehouse which is self-regulating. Both libraries link into a network of over 20 MOD Medical Libraries (Army, Navy and RAF) which cooperates in providing library material.

The libraries at Haslar and Stonehouse also have access to the Joint Services Central Library and the MOD Whitehall Library for non-medical requests and to the British Library for anything that cannot be supplied from normal sources. The Haslar Library is an affiliate member of the Wessex Regional Health Libraries and the Stonehouse librarian has close contacts with other librarians from the south west area. These various contacts enable the librarians to retrieve a wide range of information whether medical or military.

The funding of the RNMLS is provided from the Commercial Publications vote allocated by the Chief Librarian MOD at the Whitehall Library to the tri-service Head of Medical Library Services at the Royal Army Medical College, Millbank, who then allocates an appropriate amount to each of the three Services. The librarians at Haslar and Stonehouse each receive a sub-allocation from the Navy Medical allocation. HMSO publications have been disaggregated from the Chief Librarian's control for financial year 1993/94 and individual ships and establishments have to bid for their own funds for official publications via their TLB holder. The British National Formulary and Data Sheet Compendium are supplied to all three Services from the RN Medical Store at

Mr Michael Rowe is Medical Librarian at RNH Haslar.

Greenock against distribution lists supplied from Med (F&S)2(b)? at First Avenue House

HASLAR LIBRARY

The Medical Library in F Block at Haslar has a selection of medical and nursing textbooks controlled by a microfiche catalogue and arranged on shelves according to the National Library of Medicine Classification scheme Books may be borrowed for one month at a time but may be renewed at the librarian's discretion providing there are no other users waiting. Any books not held at Haslar can be obtained from the network of sources mentioned above by completing the book request forms available in all RNMLS libraries

There are also 213 current journal titles available at Haslar arranged alphabetically by title on the shelves Again any articles not held in the library can be obtained from elsewhere using the article request forms provided A photocopying facility is available for reproducing library materials—within the confines of the 1988 Copyright Act

Literature searching

The library introduced a CD-ROM facility during 1991 which currently has four databases running on it MEDLINE AIDSLINE HEALTHPLAN and CINAHL (Nursing and Allied Health) There is a guide to its use available at the side of the machine and the library staff are happy to demonstrate its use at any time either individually or in groups The library also holds printed copy of the annual Index Medicus and the monthly issues of the RCN Nursing Bibliography and Nursing Research Abstracts

Bulletins

There are several in house Bulletins available for controlling and keeping up to date with the literature These are prepared by the various MOD medical libraries and include General Practice AIDS Pathogen Therapy Inlodent Nurses and Midwives and the Haslar New Books List There is also a new Tri Service Audiovisual Catalogue of medical and nursing videos and slides and the Military Studies Library Service (MSLS) bulletin and the MOD Library Bulletin (Yellow Peril) are also available.

Reference Section

The growing reference section consists of current directories dictionaries encyclopaedias statistical tables and several major medical and nursing works A pamphlet box collection of useful papers and articles on a variety of subjects is also being developed

Catalogues and Indexes

In order to find subjects on the shelves the library has a printed Subject Index and a microfiche catalogue showing Naval and other MOD Medical Library book holdings A copy of each of these is also held at Stonehouse and Gibraltar There is also a published List of Journal Holdings at Haslar a union catalogue of MOD Medical Libraries holdings and the catalogue of periodicals of the Wessex Regional Libraries

On line literature searching

If there is a need to widen the search area beyond the CD-ROM databases available there is an on line facility in the Medical Librarian's office which allows access to DIALOG in California or DATASTAR in Switzerland These two organisations provide over 400 further databases in a whole range of subjects from archaeology to trademarks and can be accessed via the librarian at Haslar Literature search request forms are available in all the libraries and should be completed in detail wherever possible before being passed to the librarian

STONEHOUSE LIBRARY

The library at Stonehouse is located at the top of Trafalgar block at RNH Plymouth It has a similar stock and facilities to those at Haslar The CD-ROM facility there also operates MEDLINE and CINAHL (Nursing and Allied Health) and the library is equipped with a photocopier and answering machine

PROVISION TO SHORE ESTABLISHMENTS AND SHIPS

All shore based sick bay and ship provision is coordinated via the Medical Librarian at Haslar The scale of books which should be available in all sick bays has been agreed by the Tri Service Medical Libraries Committee and similarly a scale of titles for ships has been created by the MSAC Medical Library Sub Committee The books for sick bays abroad and at home are purchased and distributed from Haslar whereas the books approved for ships are bought by Haslar but distributed on application to the Medical Store at Greenock Both scales have been revised during 1992 and

distribution has started. Ships and establishments have the responsibility to ensure that their entitlement has been met as these scales are constructed to provide a minimum common base for all addressees. Further titles are often required to fulfil specific need and these are submitted with supporting reasoning to the Librarian at Haslar for consideration.

CONCLUSION

These facilities are available to medical and nursing personnel wherever they may be drafted or appointed throughout the Naval Service. If you have need of assistance please apply to the local libraries at Stonehouse or Gosport or contact this address:

Medical Library
Royal Naval Hospital Haslar
Gosport Hampshire
PO12 2AA

Telephone (0705) 584255
or Haslar Military (Extension 4[illegible] Fax [illegible]

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The Dockyard medical services

N C G Richards

(Reproduced from the August 1992 edition of Trident —the newspaper of HM Naval Base Portsmouth—by kind permission of the Editor)

A surgeon was first appointed to Portsmouth Dockyard in 1688 with two pence from each man's wages per week to pay for his upkeep. The Dockyard Medical Service is now called the Naval Base Occupational Health Service and is still experiencing many changes including sadly the loss of the old Sampson Road surgery.

In 1764 the area around Sampson Road was a saw pit, in which apprentices and their instructors worked among the wood shavings sawing large logs required for shipbuilding. Sampson Road surgery was opened in 1902 and run by the Staff Surgeon who was first appointed in 1854. In 1918 the first Surgeon Commander was appointed, and there has been a Principal Medical Officer (PMO) and serving Naval medical officers ever since, with supporting civilian staff. Until the eighties the staff were called Surgery Assistants or Poultice Wallopers by the Dockyard Mateys. They were old chaps holding a St John First Aid Certificate or were ex Navy Sick Berth Attendants. Now the nursing staff are all Enrolled Nurses (General) or Registered General Nurses most with training in occupational health. The team also includes Occupational Hygienists, Health Inspectors and support staff.

The longest serving member of staff, Lyndsay Murday who joined us in 1969 from Mauritius tells me there is also another staff member not on our books, namely the ghost of an ex PMO who could occasionally be heard tramping up the stairs to his office in Sampson Road.

Nowadays the Occupational Health Service is more than a treatment service slapping on plasters and poultices. An up-to-date Occupational Health Service is provided to nearly 8 000 employees from three medical centres —in the Naval Base at the Armament Depot at Frater and at the Helicopter Repair facility at Fleetlands, including all the smaller establishments belonging to MOD(N) as far away as Horsley and Dean Hill.

With guidance from HSE we perform statutory medicals on asbestos, lead and radiation workers, also COSHH health surveillance and seafaring medicals for the Department of Transport. We also conduct non-statutory medicals for MOD drivers, crane drivers, fork-lift truck drivers, MOD police, dog handlers, persons going overseas and those working with Thallium and Oltofuel as well as consultation for sickness absence and medical retirement. Apart from this ever-growing number of medicals we advise management, employees and unions, attend meetings and investigate problems in the workplace. We also provide an emergency treatment service to all employees within our area of responsibility and to an increasing number of outside contractors working in the Dockyard, plus the visitors to the Heritage area.

Having first worked at Sampson Road in 1969, I am sadly leaving the RN Occupational Health Service in June 1992, and yet I am pleased that I will not be around to see the old building demolished later this year to make way

Surgeon Lieutenant Commander Richards has now left the Navy; he is currently working with the Army in Bicester.

The staff [illegible] outside the PHI Surgeon Road Entrance

for the Second Sea Lord's new headquarters. The Naval Base Occupational Health Service will move in September from Sampson Road and its offices in Kings Road to temporary accommodation in the old FRMO Laboratory until a new occupational Health Centre can be built to house us all under one roof.

Acknowledgements

I would like to thank the PMO Surgeon Commander E Hodges RN and her staff for all their assistance in preparing this paper.

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Royal Naval Medical Club Dinner 1992

The annual dinner of the Royal Naval Medical Club was held in the Painted Hall Royal Naval College Greenwich on Friday 2 October 1992 when Surgeon Rear Admiral D A Lanniman LVO QHS Medical Director General (Naval) gave the following speech

Admiral Livesay Honoured Guests Ladies and Gentlemen

It is a great pleasure for me to welcome you to this the 67th annual dinner of the Naval Medical Club

We are extremely grateful to the Admiral President and to the Commander of the College Commander Searle for once again allowing us to dine here in the Painted Hall These dinners have been held here since 1953 and for anyone who hasn t dined here before you may be interested to know that this incomparable setting was the original refectory of the Royal Hospital for Seamen which was founded by Queen Mary in the latter part of the 17th century For over one hundred years it was used as a picture gallery as in those days the pensioners ate their meals in rooms below It has been suggested that possibly they were not considered eligible to dine in such magnificent surroundings The College revived its use as a regular dining hall for Officers in 1937 The most celebrated occasion in the history of this Hall occurred when Admiral Nelson s body lay here in state for three days early in January 1806 following the Battle of Trafalgar and prior to the State Funeral at St Paul s Cathedral

Our relationship with the Royal Naval College was established on a professional basis when the Naval Medical School had its home here from 1912 to the outbreak of the Second World War

I would like to thank Lieutenant Walker the Wardroom Mess Manager and a special thank you to the House Manager—Mr Middleton who retires in February next year after 42 years service with the Royal Navy We thank you for all you have done for us over the years and wish you good luck in your retirement The music provided by the Royal Marine orchestra belonging to the Commander in Chief Fleet has as always greatly added to the enjoyment of our evening I have already conveyed our appreciation and thanks to the Bandmaster Warrant Officer Peter Best. You may be interested to know that 40 members of this Band served as stretcher bearers on board the Royal Fleet Auxiliary Argus during Operation Granby

It is exactly 170 years since Sir William Burnett became the first Medical Director General of the Navy His blueprint for the Medical Service remains just as appropriate today as it was then with its emphasis on postgraduate medical education effective administration the application of scientific methods to clinical problems and most importantly an overriding concern for the sailor at sea At that time the Royal Navy was in the throes of major change I suppose one could say here we are again It was I think the Duke of Cambridge who said there is a time for everything and the time for change is when you can no longer avoid it The Ministry of Defence has been subject to endless change and reorganisation since its formation in 1964 People are expensive and so is Defence The search for economies continues apace and with our reducing financial resources, we have no option but to continue to seek ways of becoming more efficient and yet remain effective The priority for the Navy is to provide a balanced fleet which is capable of responding effectively to whatever is required of it The resources available will only make this achievable if significant savings can be found principally in the support areas.

Since taking over as MDG(N) two years ago the major focus of our activity in the Depart

[illegible] the tri-Service review on the Way Ahead as part of the support savings required under Defence for the 90s" I am absolutely delighted to welcome and pay a special tribute to Vice Admiral Sir Barry Wilson who is dining with us this evening He has successfully piloted the plan for restructuring the tri-Service hospital bed numbers through to Ministerial approval In doing so he has set the shape of our peacetime hospital posture to match the post-options requirement All three medical services owe him an enormous debt of gratitude for his patient and intensive interest in our tasks and for masterminding the way ahead Our contact with him has always been marked by his unfailing wisdom and courtesy Thank you Sir for joining us—everyone in the Defence Medical Services wish you and Lady Wilson a very long and happy retirement

The contents of the paper on the Way Ahead have recently been endorsed by the Secretary of State for Defence These are still early days and further work has to be done on both the long-term affordability and the co-ordinated approach to the National Health Service Until the proposals have been fully discussed with the Department of Health the contents of the paper remain sensitive to both local health authorities and of course to the trade unions This does not apply to Derriford as a formal announcement was made earlier this year

In essence the recommendations are—each Service hospital and integrated unit will be managed by a designated single Service The concept of Service Hospitals will be retained principally for operational reasons they will be three in number and sited at Haslar Aldershot and Wroughton To complement these it is proposed that Military District Hospital Units will be established in Plymouth for the Navy Odstock and Catterick for the Army and somewhere in East Anglia for the Royal Air Force It is judged that these integrated units will be a significantly more cost-effective solution than the retention of the small Service Hospitals which are no longer viable for training as they are unable to fulfil the criteria required by the Royal Colleges

We need a total of 1 500 peacetime beds in UK to meet the training and operational requirements for the future This size equates roughly with the current available bed numbers These beds must be recognised as a tri Service asset with free movement of trainees across Service boundaries and where advantageous cross apointment of consultants For the Navy there will be a total of 410 beds made up of 305 at Haslar and 105 at Derriford

The Naval Hospital at Plymouth is scheduled to close in 1995 Since Ministers became attracted to the integrated unit concept the traditionally strong relationship between RNH Plymouth and the local Health Authority has put the Naval Medical Service in pole position for progressing this closer relationship with the NHS

Surgeon Captain John Soul is heading the Implementation Team to flesh out the Ministerial endorsement into a contractual agreement which will be of economic mutual benefit to both parties Needless to say there are a number of outstanding issues to be resolved We are determined to get the negotiations and planning absolutely right as Ministers have declared their intention to use the Derriford Unit as a blueprint for similar arrangements in the other two Services I believe we must capitalise on the political support we are currently enjoying, and to that end I have arranged to give an update on Derriford to the Under Secretary of State for the Armed Forces (Lord Cranborne) at the end of November

With the assured future of Haslar and progress with the Derriford unit I have recently been most encouraged by the feedback from our young clinicians and nursing staff who now have a clearer perception of the way ahead The secure training base and the safe career prospects are perceived by them as being strongly retention positive measures for the future

As a permanent member of the United Nations Security Council this country has traditionally had a wider role than a number of other European countries in promoting international peace and stability I think you will agree an annual defence budget of £24 billion signals a firm commitment to this policy At the present time some of our medical staff are working with the UN organisation in different parts of the world we have three Medical Officers in Yugoslavia, another is preparing to serve in Iraq in December there are two PO Medical Assistants and one LMA serving in Cambodia In addition HMS *Cardiff* and RFA *Orangeleaf* have recently assisted people in the Bahamas following Hurricane Andrew

Our people remain our single greatest asset Although the demands and the challenges are probably greater today than they have ever been before the Navy is still regarded by the majority as a good employer and still offers huge

potential for job satisfaction and excitement One of the highlights for our Medical Service this year was when Surgeon Lieutenant Commander Andrew Hughes reached an altitude of 8,600 metres on the North Face of Mount Everest which the cognoscenti here this evening will know is only 200 metres below the summit He was accompanied on this expedition by Surgeon Lieutenant Peter Davies and we are extremely proud that they were the only two Naval representatives selected for the 18 man tri Service team Unfortunately bad weather did not allow them to achieve their ultimate goal

Real progress is being made in the forthcoming merger of the 2SL s department and CINC NAVHOME Both organisations are wholly committed to achieving this by 1 April 1994

We all support the obvious benefits which will accrue from a more streamlined and efficient medical directorate which will incorporate a revised personnel and training organisation The main part of the Medical Directorate will be housed in the new Command HQ in Portsmouth Naval Base The other part will reside in Haslar Clearance of the site is about to begin

The Director of the Naval Dental Services will follow 2SL to Portsmouth With the exception of the operational elements all Naval dental activity in the UK will be transferred to the New Medical Directorate in the Portsmouth Naval Base The smaller Navy will require redundancy of some senior Dental officers but it will not include any dental ratings The new recommendations for the Dental Branch structure have been accepted and they will be implemented from 1 April 1994 Surgeon Commodore Brinn Robinson is due to be relieved on 8 April 1993 and I would like to take this opportunity of thanking him for all his hard work and wish him and Judy a very happy retirement

We continue to be well supported by the skilled and dedicated nursing of Queen Alexandra s Royal Naval Nursing Service which this year celebrates 90 years of Royal patronage HRH Princess Alexandra honoured the Service with a visit to RNH Haslar in June of this year QARNNS officers currently stand alone of the womens services in not holding the same ranks as their parent service However proposals to bring them into line are being progressed It is anticipated that gold lace will be worn probably with an identifying badge above the curl Our congratulations go to the Matron in Chief Commandant Nursing Officer Jane Tidley who also assumed the duties of Director of Defence Nursing Services on 5 May 1992

None of these dinners would be complete without mention of the officers of the Royal Naval Reserve Sadly after 77 years of continuous service the dental branch was disbanded on 31 March this year Notwithstanding that the operational scenarios used to calculate our war requirement for the Way Ahead Paper did recognise the important role of the RNR in the casualty evacuation role and in back filling for RNH Haslar For the first time at the end of this month a fully complemented Casualty Transport Ship will exercise the ability of our reserves to fulfil their operational task The Regular/Reserve Forces Mix Study is now complete and has recommended the earlier use of reserves in times of crisis as well as the concept of an ever ready pool of reserve manpower which will require a new Reserve Forces Act in due course The final result will be an amalgam of regular and reserve personnel with the appropriate skills to meet the projected tasks

Finally I am particularly pleased to welcome our guest of honour this evening Admiral Sir Michael Livesay As the Chief of Naval Personnel and 2SL he is the Naval Board Member concerned with medical affairs When he assumed this high office in April 1991 he brought with him broad naval experience which included command of HM Ships *Hubberston* *Plymouth* and *Invincible* On promotion to Flag rank in July 1984 he became Flag Officer Sea Training From July 1986 until December 1988 he was the Assistant Chief of the Naval Staff in MOD For just over two years preceding his present appointment he was FOSNI I owe him a considerable personal debt for his readiness to listen his wise counsel and encouragement I am delighted you were able to dine with us tonight Thank you for coming and for your continued support in our endeavours

It only remains for me to welcome our guests once more and to invite members of the Club to rise with me and drink a toast to our guests

Visit to the INM Site by the Russian Nuclear Accident Response Team

Fig. 1 Lieutenant Commander K Baker presents INM certificate to Russian Team Leader Georgiy Alexsandrovich Tsarkov on behalf of the Medical Officer in Charge

Fig. 2 Surgeon Captain J R Harrison (RDRPS) explains UK Whole Body Monitoring procedures to Russian Team Leader Georgiy Alexsandrovich Tsarkov

Fig. 3 Group Photo

Fig. 4 Lieutenant N Bradley (OC NEMT Cell) explains the Health Control Post monitoring procedures

Ten senior Russians from MOD and Civilian agencies visited INM on 27 October 1992 to discuss medical and health physics aspects of nuclear weapon accident procedures, radiation monitoring procedures and environmental and public protection. They were welcomed by Surgeon Captain J W Davies QHS, Medical Officer in Charge and then given presentations and demonstrations by the Defence Radiological Protection Service and the Naval Emergency Monitoring Team (Alverstoke) Staff. The whole team were entertained by the Mess President, Surgeon Commander N E Baldock and INM Wardroom Mess members at their Trafalgar Night Dinner.

Book Review

Current Issues in Cancer Ed G M Mead Pp 140 *British Medical Journal* 1992 UK £9 95 Abroad £12 00

This slim (140 page) volume brings together 12 articles originally published in the *British Medical Journal* during 1992 The collection is edited by Dr G M Mead who also contributes a chapter on Testicular Tumours Dr Mead will be well known to those at Haslar where he undertakes a joint oncology clinic

The authors are mainly from the UK but also from France and Canada, and they succeed in providing an up-to-date consensual summary of the current status of malignant disease Necessarily short the articles concentrate on current and emerging treatment but also discuss epidemiology diagnosis screening and follow-up Particularly valuable chapters on Molecular Genetics of Cancer Biological therapy and Radiotherapy make this book a well rounded and ideal primer for those with an interest in the challenges of malignant disease as well as those who wish to understand what their colleagues are doing! I found the final chapter on Quality of Life particularly useful and thought provoking and it is refreshing to see the inclusion of this humanist and philosophical passage among the hard medical science The chapters on Lymphoma were concise and helpful and although I cannot pretend special knowledge of the solid tumours I found these chapters accessible and educational References are right up to date and include key papers I enjoyed the book and can recommend it to anyone who is involved in the treatment of malignant disease It should certainly find a place in the library

CMJ

Announcement

We have been asked to insert the following announcement

4th INTERNATIONAL SYMPOSIUM OF THE INTERNATIONAL SOCIETY FOR BRAIN ELECTROMAGNETIC TOPOGRAPHY (ISBET)

Date 20–23 July 1993
Place Convention Center Havana CUBA

For further information
Dr Nibaldo Hernandez
PO Box 6880
Ciudad Habana
CUBA

Queen Alexandra's Royal Naval Nursing Service

Kathleen Harland MA

This book was commissioned to be written by Kathleen Harland for the QARNNS Centenary celebrations in 1984. The high cost of publishing and corresponding lack of funds put the project into abeyance until it was brought to the attention of the Editorial Committee of the Journal of the Royal Naval Medical Service. Only through the financial backing of the JRNMS who have acted as publishers has it been possible to print the book.

Mrs Harland has written a comprehensive account of the History of QARNNS from their inception in 1884 up until 1988. It is a book which combines history, general interest and some anecdotes in an easy to read style. She relates the initial antipathy to females being attached to the Royal Navy, the conditions under which some QARNNS Officers served in WW2 and describes the trials of service during the Korean War and latterly the effect of the Falklands War. The book will be of interest to historians in particular the comprehensive tables at the back of the book which cover a diversity of subjects including Honours and Awards and Establishments where QARNNS Officers have served. A wide selection of photographs provide contrast and further interest for those people who may prefer just to browse through the pages.

The book costs £8.50 which includes postage. For those who can collect direct from the Office of Surgeon Commodore (NMT) the cost will be £7.50. To order a copy of the book you are requested to complete the form below and send to: ISTO, Office of Surgeon Commodore (NMT), Monekton House, Institute of Naval Medicine, Alverstoke, Gosport, Hants PO12 2DL.

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I enclose a Cheque for £ _____ made payable to
Journal of the Royal Naval Medical Service

SIGNATURE _____ DATE _____

Obituary

Surgeon Rear Admiral Maurice Henry Adams CB died 21 May 1992. He was born on 16 July 1908 and qualified at Queens University Belfast in 1932, joining the Royal Navy in 1934.

His son Surgeon Commander B M Adams writes

I never really knew my father before he was a Surgeon Commander in the Royal Navy—in fact I never knew him before 1950 when he first went to Malta and I was a boy of 10.

He was devoted to the Royal Navy and at that time living in Malta he had a full and satisfying life of eye surgery, sailing both small boats and larger ones and attending all the parties and social life that one is expected to on a detached deployment.

He was sent back to England in the early months of 1953 and was appointed to RNH Chatham where in 1956 he was made a Captain. In 1957 he was appointed as Medical Officer in Charge of Trincomalee, Ceylon where he spent many happy hours painting local scenery until my mother arrived before that Christmas. He spent about 18 months there and was then posted to the job of appointer to the RN Medical Service in London.

It was while doing this job that he developed a carcinoma of the larynx in 1961 and was treated with the 'Cobalt Bomb'. He was shortly said to be cured of all malignancy and was appointed as Surgeon Rear Admiral and posted to RNH Bighi, Malta in 1963. At that time he devised the saying that he spent a year learning the job a year enjoying it and a further year on his rundown period. The post in Malta gave him a large parish and he was technically in charge of the whole Mediterranean. He was achieved by Surgeon Rear Admiral Dudley Gard CB another graduate of Queens University Belfast and also an eye surgeon of note.

He [illegible] the Royal Navy [illegible] and went to [illegible] Bath [illegible] ing the old [illegible] St Bl [illegible] w [illegible] Inc. The [illegible] and the [illegible] and went in total [illegible] in 1972 and went to live in Rock Cornwall from that time. He was a prolific and dedicated golfer all of his life and was a single figure player when he was appointed Captain for the standard three years in the mid 70s. During this stage of his life he was also doing sessions at St Austell and Truro in the ophthalmological world and these he continued until 1982.

He was elected President of the St Enodoc Golf Club in 1980 and continued this very enjoyable but taxing occupation until April 1992. He subsequently died in May 1992.

My father was an accomplished artist and home furniture maker. He was also a fine story teller and there were many times when he had his audience rolling around with laughter. He was an accomplished sailor and enjoyed a pint or two on a pub visit.

He leaves a widow and three children myself a Surgeon Commander in the Royal Navy, Moya who has settled in Canada and Pat who is a Theatre Sister in the Nuffield Hospital, Plymouth.

We have recently learnt of the death on 22 October 1992 of **Surgeon Rear Admiral Dermot Frances Walsh CB OBE** who retired from the Royal Navy in 1961. We have also been advised of the death on 10 July 1992 of **Surgeon Commander Alexander Robinson Harper VRD RNR** who served with the Royal Navy during World War Two and on 31 October 1992 of **Surgeon Lieutenant Commander Paul Howard Cooper Royal Navy**.

Any personal reminiscences of these officers will be welcomed by the Editor.

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SERVICE NEWS

ROYAL NAVAL MEDICAL AND DENTAL OFFICERS

HONOURS AND AWARDS

The Most Venerable Order of the Hospital of St John of Jerusalem
Officer (Brother)
Surgeon Captain J W Davies

NEW YEAR HONOURS 1993

Companion of the Order of the Bath
Surgeon Rear Admiral D A Lammiman LVO

Commander of the Order of the British Empire
Surgeon Commodore J M Beales

APPOINTMENTS AND PROMOTIONS

As Medical Director General (Naval)
February 1993
Surgeon Rear Admiral A L Revell QHS

As Chief Staff Officer (Medical and Dental) in the rank of Surgeon Commodore
22 January 1993
Surgeon Captain M F W H Paine

As Director of Dental Services (Naval) in the rank of Surgeon Commodore (D)
6 April 1993
Surgeon Captain (D) T J L Hall OBE QHDS

As Consultant Adviser in A&F Medicine in MDG(N)
8 February 1993
Surgeon Commander M Sach

To Surgeon Lieutenant Commander (D)
C M Elnek

To Acting Surgeon Lieutenant
E J Lacey

Provisional Selections for Promotion to date 30 June 1993

To Surgeon Captain
M A Farquharson Roberts J R C Caine

To Surgeon Captain (D)
J V Hollond

To Surgeon Commander
S D Evans P A Glew P H Hardy
M R Dean H J Cox

HIGHER QUALIFICATIONS

Surgeon Commander D C Brown—MSc (Radiation Biology)
Surgeon Lieutenant Commander M A Howell—FRCS
Surgeon Lieutenant Commander P J Benton—M Med Sci (Occupational Health)
Surgeon Lieutenant Commander P A Hughes—MRCGP

ATTAINMENTS BY JUNIOR DOCTORS

Surgeon Lieutenant Commanders N Q Allison and P A Hughes have completed GVPT
Surgeon Lieutenant Commander P C Young and Surgeon Lieutenant S C P Bree have passed FRCAnaes Part II
Surgeon Lieutenant F P O'Kelly has passed FRCAnaes Part I

CONSULTANTS, SENIOR SPECIALISTS AND SPECIALISTS

The following professional advancements are announced

Consultants
Occupational Medicine
Surgeon Lieutenant Commander J R Broome—November 1992
Surgeon Lieutenant Commander M S Smith—November 1992

Senior Specialist
Anaesthetics
Surgeon Lieutenant Commander J L R[illegible]

NEW ENTRIES

Surgeon Lieutenant Commander A D Newland
Surgeon Lieutenants (D) N J Davenport
P L Kearney M Kelly K N Wallace
Surgeon Sub Lieutenants (Miss) F T Marshall
R J Birch J L Denholm D J Hughes
J J Smith (Miss) S J Lane S T W Low-Gor
Surgeon Sub Lieutenants (D) P G Monte
M E Harris

PLACED ON EMERGENCY LIST

Surgeon Lieutenant S J Easterbrooke

RETIREMENTS

Surgeon Rear Admirals D A Lammiman LVO
F StC Golden OBE
Surgeon Commanders P M Adams
D E Day J C Grant

NEWS OF SERVING OFFICERS

Surgeon Captain E P Dewar has been elected to the Court of Examiners of the Royal College of Surgeons of England for Parts A and B of the FRCS(Eng) examination

MEDICAL SERVICES
AWARDS
NEW YEAR HONOURS 1993

Member of the Order of the British Empire
Lieutenant Commander J R Dalgleish

Opening of HMS Gannet Sickbay

The new Sickbay at HMS Gannet was op[illegible]ls by Surgeon Cap[illegible] A J S[illegible] Principal Medical Officer (Health and Safety) to Fleet Officer Naval Aviation. The facility [illegible] st sickbay in the programmed refurbishment of the old WW [illegible] build[illegible] and was planned and implemented [illegible] less than six months courtesy of NMS.

The staff comprising of CMP Dr James Begg and four ratings look after not only the Naval complement but also RAF Prestwick and provide cover for the 24 hour SAR commitment. Dental cover is provided by HMS Cochrane on a peripatetic basis.

Mrs Jill Hirst presenting the first Alan Hirst Memorial Prize to Surgeon Lieutenant Simon Rudland for his work in Knidaria

Nominations for this annual award should be sent to Surgeon Captain R D Carr Adviser in General Practice to MDG(N) at HMS Drake

QUEEN ALEXANDRA'S ROYAL NAVAL NURSING SERVICE

APPOINTMENTS AND PROMOTIONS

To Superintending Nursing Officer
J F Flutter R C Smith

To Nursing Officer
S M Offin

NEW ENTRIES

Senior Nursing Officer L Ponting

TRANSFER TO FULL CAREER COMMISSION

Superintending Nursing Officer
J D Buchanan

TRANSFER TO MEDIUM CAREER COMMISSION

Senior Nursing Officers H E L McKillop
G E Watkinson P N E Batton
N J Broom R M Duke M D Watts

TRANSFER TO 8 YEAR SHORT CAREER COMMISSION

Senior Nursing Officer F K Gunrunin

RETIREMENTS AND RELEASES

Senior Nursing Officer P J Hewitt

ROYAL NAVAL RESERVE

PROMOTIONS

To Surgeon Lieutenant Commander
M W English—*Cullinge*

PLACED ON RETIRED LIST

Surgeon Lieutenant Commander R P Norwich—*Flying Fox*
Surgeon Lieutenant Commander J G Reddall

REMOVED FROM ACTIVE LIST

Surgeon Lieutenant Commander M Y Morgan—*President*

RESIGNATIONS

Surgeon Lieutenant Commander P J Hilton—*Dragon*

ARE YOU CORRECTLY ADDRESSED?

The names and addresses of subscribers to the J[illegible] Royal Naval Medical Service are being transcribed from a card index system to a computer database which [illegible] maintain. In order to ensure that this database is as far as possible kept up to date [illegible] details are at present incorrect are invited to complete the tear-off form below [illegible] Editorial Secretary. The form may also be used to notify future changes of address.

To: Editorial Secretary, Journal of the Royal Naval Medical Service, [illegible] Alverstoke, Gosport, Hants PO12 2DL

Please note my correct*/new* address

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Date

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No 2 Summer 1993 Vol 79

JOURNAL of the ROYAL NAVAL MEDICAL SERVICE

ISSN 0035 9033

Contents

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Editorial

Not for the first time in its history the JRNMS is experiencing considerable financial difficulties with a net loss of approximately £5000 over the past two years. The Editorial Board has approved various measures to try to remedy the situation including changing printers and actively seeking more advertising revenue. However the major cause of loss of income is the gradual but seemingly inexorable loss of subscribers. This loss appeared to be increased significantly by the last rise in the annual subscription from £8 to £12 which is why the Board is reluctant to increase the subscription further.

The RAMC operate a policy of automatically deducting the annual subscription for their Journal from the pay of all RAMC officers and this appears to be accepted without major objections. It is a sad fact that a considerable proportion of currently serving RN Medical Officers are not subscribers although most of them probably do get to see a copy of most issues. What is the feeling amongst current subscribers as to the best way to increase the circulation and therefore increase income? Any and all constructive suggestions will be gratefully received.

In the meantime would you all try and persuade your non-subscribing colleagues to change their minds and come to the rescue of the JRNMS. It is not supported by public funds, if it cannot be made to be self supporting it will have to cease publication.

chill may influence the skin and subcutaneous tissue temperature of the diver before during and after a dive although this will also depend on the degree of insulation provided by clothing These temperature mediated effects on local tissue perfusion and the tissue solubility of inert gas could have a bearing on the risk of DCS

Wind speed

Wind speed influences sea state and wave height, often in conjunction with tide Wave height could effect not only the ability to assess depth accurately from a boat but also make accurate depth keeping increasingly difficult at shallower decompression stops Any inaccuracies in depth assessment could result in an increased likelihood of DCS

Tide

Tidal flow during the course of a dive will tend to increase the work necessary to perform underwater tasks as the diver must swim constantly just to stay in the same place The increased muscular exertion provokes increased cardiac output and peripheral blood flow Tissues with increased perfusion absorb more inert gas in a given time and thus diving in conditions where there is a strong tidal stream might be expected to increase the risk of DCS In Service diving, it is recommended practice to calculate the decompression for a deeper or longer dive than was actually performed if the dive involves hard physical exertion[2]

In addition to tidal flow change in depth of water due to tide could affect the incidence of DCS by reducing the accuracy of depth assessment

SUBJECTS AND METHOD

Case finding

The subject cases for the study were all the diving accident cases reported to and recorded by the Undersea Medicine Division of INM in the six years 1984 1989 Suitable cases of DCS for inclusion in the study were identified by scrutiny of the 831 handwritten diving accident records covering those years All cases diagnosed at the time as cerebral arterial gas embolism (CAGE) or pulmonary barotrauma were rejected and all cases with a dive history of emergency or panic ascent which could predispose to these diagnoses were also excluded Cases of non-diving related illness were excluded by reviewing follow up notes and by rejecting cases unresponsive to compression treatment

Extraction of details from diving accident records

The following details were sought from each DCS case record

1 Diagnosis (type of DCS)
2 Date and time of dive or dives
3 Location of dive
4 Depth of dive(s)
5 Duration of dive(s)
6 Decompression stops made (if any)
7 Time from end of dive to onset of symptoms
8 Location of diver at onset of symptoms
9 Age and sex of diver

The first five items listed above were considered essential to the study and cases where any of these details were missing were rejected Absence of any of items 6 to 9 although important were not considered so vital as to exclude the case from the study

Decompression requirement

To determine any inadequate or omitted decompression the dive profile for each case was compared with Royal Navy Air Decompression Table 11 as an arbitrary standard Where multiple dives took place on the same day the RN rules for combined dives were applied to the calculation As many case records contained only vague or absent details of any stops carried out on ascent the calculation was based on the basic diver profile alone ignoring any purported stops

The calculation of omitted decompression allowed the subject dives to be divided into two basic groups which formed the basis for the creation of a database

a **Index 'SAFE' group**
Those dives which appeared to conform with the schedules specified in RN Table 11 as no stop dives following which DCS would not have been expected to occur

b **Control 'RISKY' group**
Those dives which exceeded the 'safe' limits as defined by RN Table 11 and in which DCS was not wholly unexpected

Weather data

The Meterological Office at Bracknell holds archive weather data collated from recording centres throughout the British Isles. Knowing the date time and location of the dive resulting in each case of DCS the following weather data was ascertained

Table 1 All Dives — Air temperature in °C

	<12·9°	13·16·2°	16·3·18·5°	>18·5°	All
Safe	21 (50%)	18 (43%)	3 (7%)	0 (0%)	42
Risky	34 (25%)	34 (25%)	33 (25%)	34 (25%)	135
Totals	55	52	36	34	177
Safe as % of total	38%	34%	8%	0%	24%

$\chi^2 = 25.05$ with 3df $p < 0.001$*

Table 2 All Dives — Windchill factor

	0·410	411·500	501·612	>612	All
Safe	4 (10%)	2 (5%)	17 (40%)	19 (45%)	42
Risky	34 (25%)	33 (25%)	34 (25%)	34 (25%)	135
Totals	38	35	51	53	177
Safe as % of total	11%	6%	33%	36%	24%

$\chi^2 = 16.38$ with 3df $p < 0.001$*

Table 3 All Dives — Air minus water temperature in °C

	−10 to −0·2	0·1 to +1·5	1·6 to 4·1	>4·1	All
Safe	19 (45%)	14 (33%)	7 (17%)	2 (5%)	42
Risky	34 (25%)	34 (25%)	33 (25%)	34 (25%)	135
Totals	53	48	40	36	177
Safe as % of total	36%	29%	17%	6%	24%

$\chi^2 = 12.51$ with 3df $0.01 > p > 0.001$*

Table 4 All Dives — surface water temperature in °C

	1·11°	12·14°	15·16°	17·18°	All
Safe	14 (33%)	19 (45%)	5 (12%)	4 (10%)	42
Risky	28 (21%)	41 (30%)	43 (32%)	23 (17%)	135
Totals	42	60	48	27	177
Safe as % of total	33%	32%	10%	15%	24%

$\chi^2 = 10.12$ 3df $0.02 > p > 0.01$*

Table 5 All Dives — Wind speed (mph)

	0·6	7·10	>10	All
Safe	15 (36%)	13 (31%)	14 (33%)	42
Risky	41 (36%)	55 (41%)	39 (29%)	135
Totals	56	68	53	177
Safe as % of total	27%	19%	26%	23%

$\chi^2 = 1.29$ with 2df $p > 0.5$

who remains warm during the bottom phase of the dive will maintain blood flow to peripheral tissues better than the diver who is cold with peripheral vasoconstriction during these periods

Although in both the above situations divers will absorb excess nitrogen into their tissues while they descend in the water and remain under pressure at the bottom, the cold diver will absorb less inert gas than the warm diver because of lower peripheral blood flow. This reduction in inert gas load may be partially offset by an increase in tissue nitrogen solubility as temperature falls[7] but this effect is likely to be small over the physiological range and its importance is controversial[8]. Evidence for the relatively greater inert gas load taken up by the warmer diver is provided by the observation that divers kept warm by hot-water fed diving suits experience more DCS[9].

The process by which excess inert gas is eliminated from the body of a diver can be divided into the in water decompression phase (including time swimming on the surface) and the surface phase of 'off gassing' which continues for some hours after leaving the water.

In water decompression phase

The in water decompression phase is the phase of maximum reduction in pressure. The diver who is warm during the dive and remains warm during the in water decompression phase will experience little change in the perfusion of peripheral tissues other than that promoted by exercise. If however the diver becomes cold and peripherally vasoconstricted during the in water decompression phase the rate at which excess inert gas can be eliminated is reduced and may become sufficiently slow to allow gas bubbles to form. These circumstances are common in UK waters which are relatively cool and even with good thermal protection most divers will begin to cool, at least peripherally, toward the end of a dive. Longer, deeper dives where compression stops are required are particularly likely to involve cold periods of inactivity at the end of the dive.

For the diver who has been cold and peripherally vasoconstricted throughout the dive being cold during the in water decompression phase is less of a problem as his excess gas load is smaller.

Surface 'off gassing' phase

On emerging from the water the diver still has a significant excess of inert gas dissolved in tissues. The results of this study suggest that unexpected DCS is unlikely to occur with surface air temperatures of over 18.5°C and that 'safe' dives are more likely to result in DCS if the surface environment is cold or as windchill increases. The risk also appears increased if the air temperature is colder than the surface water temperature. Such observations are readily explicable if the rationale behind the effects of thermal state during the dive are extended to the post-dive surface environment. It seems likely that continued or aggravated peripheral vasoconstriction in the post dive surface phase may delay inert gas elimination sufficiently to precipitate DCS.

The cooling from a damp neoprene wet suit exposed to windchill may be substantial and be expected to cause peripheral vasoconstriction and reduced blood flow to superficial tissues[8]. An impermeable dry suit with warm underclothing may give better thermal protection but during the course of the dive the underclothing will frequently have become damp around the wrist and neck seals reducing thermal insulation. Once out of the water the tendency of many divers to remove any hood worn during the dive thus exposing the head with wet hair is likely to increase any cooling effect.

The study found that 'safe' dives which result in DCS appear to be associated with a small or negative difference between air and surface water temperature. When this situation exists the sensation that it is warmer in the water than out is familiar to anyone who indulges in watersports around Britain's coasts. On leaving the water the resulting reflex peripheral vasoconstriction is independent of any marked fall in core temperature and depends on relative cooling of the skin[10]. This will tend to prolong or exacerbate vasoconstriction of the peripheries or initiate it if none pre exists due to cold exposure during the dive. The occurrence of vasoconstriction due to *relative* skin cooling may explain the observation that cases of DCS followed 'safe' dives during the warmer summer months in the UK as well as during cooler times of year.

An explanation for the finding that no unexpected cases of DCS occurred if the air temperature was greater than 18.5°C may be that provided the post dive environment was warm enough the diver was unlikely to experience peripheral vasoconstriction for long enough or of sufficient degree to impair inert gas elimination.

Other studies provide supporting evidence for

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Paediatric resuscitation in adverse circumstances: A comparison of three routes of systemic access

S Q M Tighe, S V Rudland, P M Kemp and C R Kershaw

Summary

Nine Kurdish children were admitted to a British Surgical Support Team facility in Northern Iraq requiring resuscitation for dehydration estimated to be of 10% loss of body weight. Systemic access was by intravenous (IV 6 patients) intraosseous (IO 6 patients) and/or intraperitoneal cannulation (IP 4 patients) and resuscitation was according to a defined protocol. Insertion times, maximum initial flow rates and complications were assessed. The mean insertion times were 78, 112 and 26 seconds and the mean maximum initial flow rates of crystalloid were 240, 60 and 400 ml/hour for IV, IO and IP routes respectively. One IV lasted more than 24 hours and three failed. One IO cannula blocked and one IP was removed because of saline extravasation. IO bolus injections were painful. Total volumes infused and time to adequate hydration varied widely and there were no complications. The mortality was 33% compared with 11% for 18 less severely dehydrated children. It is concluded that the IP and IO routes allow severely dehydrated children to be resuscitated without significant complications when IV access is difficult to establish.

INTRODUCTION

In severe dehydration of any aetiology rapid systemic fluid resuscitation is the key to successful management. Intravenous (IV) administration is the ideal but access is often difficult and/or time consuming due to the inevitable circulatory collapse[1]. For children the intraosseous (IO) route is an alternative, allowing rapid reliable access to the systemic circulation without significant associated morbidity[2]. Intraperitoneal (IP) administration has been recommended for the same purpose[3].

This paper compares the above three routes of administration for the resuscitation of Kurdish refugee children in a field hospital. The children suffered from severe dehydration associated with chronic diarrhoea, protein calorie malnutrition and circulatory shock. A protocol for fluid administration is also presented.

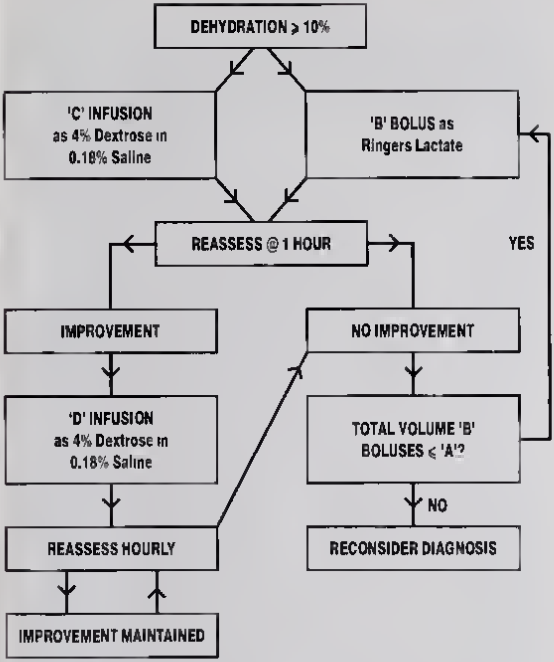
PATIENTS AND METHODS

Systemic fluid was administered to nine children admitted to the Royal Marine field hospital at Sirsenk, Northern Iraq, who were estimated to have lost more than 10% of their body weight due to dehydration. 10% dehydration was defined as follows:

1. Flaccidity and drowsiness.
2. Systolic blood pressure less than 60 mm Hg or finger nail bed capillary return greater than 5 seconds.
3. Poor tissue turgor, no tears, sunken eyes.

The receiving medical officer attempted percutaneous IV access using a 23G Butterfly needle (Venisystems™ Abbot Ireland Ltd). If this failed or if another route of access was considered desirable a second operator inserted a 14G IO trocar (Cook Medical USA) or an IP 21G Butterfly needle or both. The site of venous access was at the operator's discretion. IO trocars were inserted into the upper tibia after local anaesthetic infiltration according to the manufacturer's instructions (*Figure 1*). IP

Surgeon Commander Tighe is a Consultant Anaesthetist at RNH Plymouth. Surgeon Lieutenant Commander Rudland has now left the Navy on the Emergency List and is in General Practice in Devon. Surgeon Lieutenant Commander Kemp is Lecturer in Nuclear Medicine in RNH Haslar. Surgeon Commander Kershaw is a Consultant Paediatrician at RNH Haslar.



A mls – % Dehydration × Weight (Kgs) × 2·3 × 10
B mls – 20 × Weight (Kgs) for first bolus 10 × Weight (Kgs) subsequently
C mls Hr – 4 × Weight (Kgs)
D mls Hr – $\left[\frac{\text{A – (Total volume of 6 boluses)}}{\text{24 – Time elapsed (Hours)}}\right]$ + C

IMPROVEMENT CRITERIA
2 of the following
1 Urine Output > 1ml Kg Hr Age > 12 12
2ml Kg Hr Age < 12 12
2 ↓ Pulse ↑ Blood Pressure and ↓ Capillary Refill Time
3 Improvement in Tissue Turgor

Fig 2 Paediatric infusion protocol for the treatment of severe dehydration (>10%)

and no obvious infections were seen The slow flow rates achieved with the IO cannulae are similar to those described by some authors[11] although Arbeiter and Greengard[1] achieved a mean rate of 138 mls per hour by gravity alone In infants it has been suggested that the cannula should be inserted more proximally at the level of the tibial tuberosity where the medullary cavity is larger so that higher flow rates can be achieved No cannulae became displaced and reliable means of access to the systemic circulation was preserved proving to be life saving in one case However blockage can occur and regular flushing is required

IV infusion remains the method of choice when the patient s condition and available skill allows but it can be technically difficult to secure venous access in very small shocked infants In this study IV cannulation was not attempted and therefore can be considered to have failed on three occasions because of multiple venepuncture attempts by the referring physician or extreme peripheral vasoconstriction In comparison IO and IP insertions were always successful and are a useful means of expanding the intravascular compartment to facilitate later IV access Half the IV cannulae lasted within 18 hours of insertion and whilst access would undoubtedly have been prolonged by the use of a catheter instead of a needle IO and IP routes were more reliable

The infusion protocol (*Figure 2*) was constructed in the field from the Paediatric Vade Mecum[12] erring on the side of caution to prevent fluid overload and electrolyte imbalance. It was not possible to assess serum electrolytes and as diarrhoea was the inevitable aetiology dehydration was considered to be isotonic It is possible that hypertonic dehydration may have been more frequent than realised due to excessive fluid rather than electrolyte loss in the diarrhoea or the previous use of electrolyte rich oral rehydration fluids in a hot dry climate The protocol has not been objectively studied and requires more thorough assessment before it can be recommended without reservation

The mortality of 33% is compared with a rate of 11% in far less severely dehydrated and malnourished children These high mortality rates probably reflect the associated pathology rather than the dehydration itself

The difficulties with refined numbers in this study and the field situation precluded the use of adequate controls proper randomisation and statistical analysis Our observations must be regarded in this context

In conclusion the IP and IO routes allowed severely dehydrated children to be reliably rehydrated without significant complications These procedures required less skill and were more frequently successful than peripheral IV cannulation When experienced venepuncturists are unavailable or IV access is difficult to establish one or a combination of these alternative techniques may be life saving

ACKNOWLEDGEMENTS

The authors are indebted to members of Medical Squadron of the Commando Logistics Regiment 3 Brigade Royal Marines for their help and support with this project in most stressful circumstances

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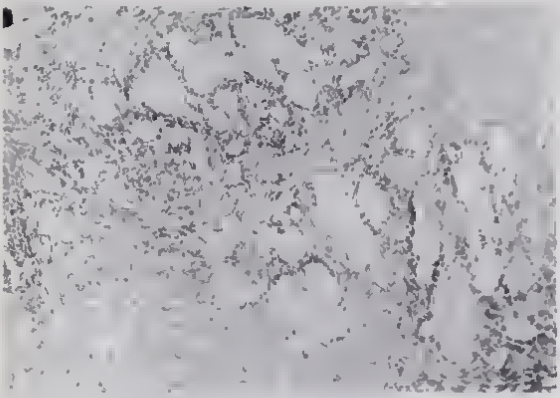

Fig. 1 Photomicrograph showing a mixture of angiomatous and solid areas with no residual lymph node structure.

DISCUSSION

The striking feature of this case is the rarity of the tumour which has proved extremely difficult to diagnose. The term polymorphous haemangioendothelioma has been suggested by Chan and co workers to emphasise the variable histological patterns seen in different parts of the same tumour. These appearances help to distinguish this tumour from spindle cell haemangioendothelioma and epithelioid haemangioendothelioma.[4] This previously uncharacterised tumour is described as a borderline malignant vascular tumour exhibiting solid primitive vascular and angiomatous patterns with relatively bland cytological features. Two other cases of polymorphous haemangioendothelioma have been reported by Chan *et al*.

Because of the extreme rarity of this previously unrecognised condition there is very little clinical experience of its management. In particular the behaviour of the tumour is uncertain and it is not yet clear whether the tumour can occur at extranodal sites or whether it can metastasise. The case reported suggests there is a high risk of local recurrence and that consideration should be given to early lymph node clearance in the affected field. A policy of surveillance has been adopted in view of the uncertain benefit of adjuvant radiotherapy in this condition.

Clinicians should be aware of this rare condition which has a potential for local recurrence if initial surgery is insufficiently radical.

ACKNOWLEDGEMENTS

We wish to thank Dr C D M Fletcher of the Department of Histopathology, St Thomas' Hospital, London for his helpful advice and Mr R J Leicester, OBE, FRCS of St George's Hospital, London for allowing us to report this case.

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A clinicopathological survey of gallstones in the autopsy population

R Heames and Clair du Boulay

Abstract

This prospective study looked at the autopsy prevalence of gallstones and their relationship with symptoms and gallbladder pathology

Fifty consecutive autopsies were selected The gallbladder was examined macroscopically and microscopically and gallstones were examined cut and classified

Four females at autopsy had had previous cholecystectomies Thirty three percent of patients had gallstones at post mortem with a male to female ratio of 1 1 24 Histological features of the gallbladders were normal 39 1% cholecystitis 37 0% hypertrophy 8 7% and fibrosis 15 2% Increasing age was significantly associated with increasing common bile duct (CBD) circumference

Muscle hypertrophy and fibrosis may represent part of a spectrum of barrel out gallbladder disease Fifteen percent of autopsy patients had calculi cholecystitis but were asymptomatic and the reason for this is unclear

INTRODUCTION

Cholelithiasis is one of the most common alimentary tract diseases with an estimated 20 million people having gallstones in the USA alone[1] The prevalence of gallstones has risen significantly in the last century giving rise to the concept that gallstones are a disease of civilisation The crude overall prevalence of gallstones at autopsy ranges from 1 5 44% [2] or 17 59 6% for women and 6 9 41 5% for men[3] Most screening studies show a positive relationship between the prevalence of gallstones and age[3] Gallstones are rare in children but do exist[4] and after the age of 40 the rise in prevalence is steady Cholelithiasis is significantly more common in women than men in all age groups[5] The female to male ratio is approximately ? 3 1[6] but over the age of sixty years_ this ratio approaches 1 1[6]

Cholesterol is the major component of gallstones in communities which have adopted a Western diet and culture[7] The amount of cholesterol in a stone varies from 11% 98%[8] decreases with age and higher amounts are more common in women[1] Pigment gallstones account for 11 33% of all gallstones[9] and are more common in men[1] Seventy eight to ninety percent of calculi are of mixed variety[1,9] Cholesterol and pigment stones represent two different conditions with different pathogenesis and probably different risk factors[1]

The vast majority of gallstones are asymptomatic and this increases with age Gallstones present as biliary pain in 5 22% of gallstone subjects or less often as acute cholecystitis biliary obstruction or pancreatitis[4] In a study comparing 285 people with gallstones and 1044 people without the frequency distribution of epigastric and/or substernal burning upper or lower abdominal pain intolerance to fatty food nausea and/or vomiting and jaundice was similar for the two groups[10]

The natural history of silent gallstones shows that 50 70% of patients remain free of complaints and symptoms during life[11] If stones do become symptomatic it is sooner rather than later[10] In contrast patients with mildly symptomatic stones are at risk for future pain and complications Gallstones may give rise to non specific symptoms and it is difficult to define any abdominal symptom or combination of

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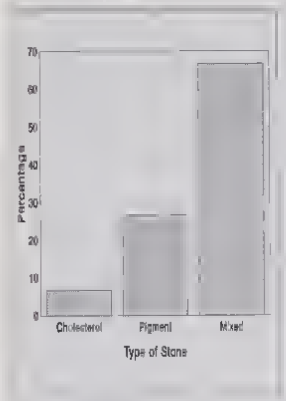

Figure 2 Classification of Gallstones

Table 1 Frequencies and Types of Symptoms

Symptom Type	Percentage
Epigastric/substernal burning	12 2%
Upper abdominal pain	14 3%
Lower abdominal pain	14 3%
Intolerance to fatty food	2 0%
Nausea +/ vomiting	10 2%
Jaundice	6 1%
Other	4 1%

Table 2 Macroscopic and Microscopic Features

Features	Percentage
Normal	36%
Inflammation only	17%
Hypertrophic only	4%
Fibrotic only	11%
Gallstones only	4%
Gallstones and inflammation	15%
Gallstones and hypertrophy	2%
Gallstones and fibrosis	6%
Gallstones inflammation and symptoms	4%

(*Table 1*). Overall 33 3% of the autopsy patients with gallstones had symptoms Conversely 16 1% of patients had symptoms but no stones

The following histological features were documented 39 1% were normal 37% had inflammation present in the wall 8 7% contained smooth muscle hypertrophy and fibrosis was found in 15 2% of gallbladders 11% of histologically normal gallbladders contained stones whereas the figure was 53% for inflamed gallbladders Listed is a table summarising all the features (*Table 2*)

The external appearance of the gallbladder was abnormal in 10 9% of cases and all of these contained biliary sludge when opened

The common bile duct (CBD) circumference showed a normal distribution of measurements with a mean of 16 5 mm The CBD circumference tended to be low when gallstones were present Increasing age was significantly associated with increasing CBD circumference ($p=0\ 04$)

DISCUSSION

Previous autopsy studies which looked at the prevalence of gallstones and their relationship to gallbladder pathology have not included gallbladder histology There were almost equal numbers of males and females in the autopsy study but four of these females arrived at post mortem having previously had a cholecystectomy This confirms the well known fact that more women have their gallbladders removed than men This study focuses mainly on the elderly age group — 90% of subjects were over 60 years of age

Thirty three percent of the autopsy patients were found to have gallstones and this was in accordance with other similar studies although at the upper end of the range [4] Gallstones were more commonly found in women with a male to female ratio of 1 1 24 This is in agreement with the literature which states that over the age of sixty years the male to female ratio approaches 1 1[5]

The majority of stones (66 7%) were of mixed type and this figure was lower than that which Armand *et al* showed (78%) Interestingly the number of pigment stones was much higher than expected although Trotman and Soloway[1] showed that pigment stones were more common in people aged with a peak incidence in the 70 79 year age group The number of

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also educational The senior residents would present patients discuss literature relative to the case and then undergo a searching grilling from the attending surgeons

The first week was quite tough a new country, a new medical environment where the protocols and procedures were subtly but significantly different from the United Kingdom Once a basic understanding of how the system worked was gained then there was a great opportunity to learn the principles of trauma management probably the best outside of a war zone although at times it seemed as if there was indeed a war going on Nothing could have prepared me for my first night on call It was quiet until late evening then the admissions were non-stop until 6 am These included two gunshot wounds one to the abdomen and one to the leg three victims of road traffic accidents two of whom were seriously injured two brutal assaults which between them required 60 70 stitches another assault and finally a cocaine dealer who had been almost scalped by a machete Throughout this onslaught the trusted procedures of emergency care were adhered to and all patients received a thorough work up A senior resident performed the primary and secondary survey, and the appropriate management was undertaken The calm professionalism and unflappability of all the staff from the nurses to the senior surgeons was most impressive At breakfast after the last patient had been dealt with the senior resident Jan Hamilton commented that it had been a fairly typical night at MedSTAR

As the month progressed and the trauma and was less busy I was taught some of the practical procedures involved in trauma management These included internal blood sampling via femoral and radial sites establishing intravenous access placement of nasogastric tubes insertion of Foley catheters positioning of chest tubes diagnostic peritoneal lavage and insertion of intra-cranial pressure monitors as well as plentiful opportunities to practise suturing

Every day we undertook two full ward rounds in which the students were expected to play a full part I would collate the results of tests performed on our patients and review their progress and then present them on the ward rounds The importance of developing a systematic way of doing this soon became apparent

The month was exceptionally hard work Every day involved clinical work Non call days would start around 6 15 am when I would check on the patients to gain the necessary information to present on the 7 am ward round More often than not on call days would mean 24 hours awake with 12 midnight to 6 am the period when the workload was heaviest By the end of the month I had had intense exposure to acutely ill patients developed a greater knowledge and confidence in how to manage these patients and importantly for finals confidence in presenting patients

SURGICAL INTENSIVE CARE

Following the attachment to MedSTAR I spent a week attached to one of the several surgical intensive care units at the hospital After the excitement and immediacy of the MedSTAR unit it was difficult to be so committed to this attachment but several things became apparent during the week The equipment used in the unit was the latest in high technology and extremely costly The nurses in the unit were highly motivated and trained to a high standard Listening to several attending surgeons and intensivists discuss post-operative care it was clear that much was still unknown about how the body adapts physiologically to major illness and injury

FLYING PRESENTATION PREVENTION AND SKIING

While with the unit I was able to spend a day on call with the paramedics this meant that I rode in the helicopters It was interesting to see the calm cool efficiency of these people at the scene and I was afforded an excellent view of Washington from the air Like many bodies of nursing they have a somewhat ambivalent attitude towards medical students and I was the first student to be allowed to do this

I also attended a day long seminar organised by the Department of Medicine which was designed to improve the presentation skills of the medical residents A slick and professional communications consultant was employed and he ensured that it was a beneficial experience A similar programme using a video recorder would be a very useful adjunct to the King s curriculum and help to provide confidence in our presentations

MedSTAR is also involved with the prevention of the violence with which it often has to deal The Washington Community Violence Prevention Programme is run from the hospital Members of the programme include a former cocaine dealer who had his life saved by Dr Howard Champion the British Director of MedSTAR The programme goes out into the

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The centenary of the sinking of the Mediterranean Fleet flagship, HMS *Victoria*. What was the role of Malta fever?

D J Vassallo

Abstract

This article commemorates the centenary of the tragic loss of the battleship HMS *Victoria* and 358 of her crew together with the Commander in Chief of the Mediterranean Fleet Vice Admiral Sir George Tryon as a result of an enigmatic order by Tryon himself It also investigates the medical aspects and explores the contention that Tryon was suffering from Malta or Mediterranean fever (Brucellosis)

INTRODUCTION

This year marks the centenary of one of Britain's greatest peacetime naval disasters the collision in calm seas off the coast of Syria on the 22nd June 1893 between two of Her Majesty's finest battleships the *Victoria* and the *Camperdown* the flagships of the First and Second Divisions of the Mediterranean Fleet This disaster resulted in the loss of the *Victoria* and 358 of her crew including the Commander-in Chief of the Fleet Vice Admiral Sir George Tryon and shocked the nation as much as the loss of the *Titanic* twenty years later

Tryon's enigmatic order to the two divisions of the Fleet to reverse course by turning inwards towards one another led directly to the collision and the controversy surrounding this order still engenders heated debate and speculation [1] This article describes the event and explores the contention that Tryon was suffering from Malta Fever adding its own twist to this speculation

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BACKGROUND

The Admirals

Vice-Admiral Sir George Tryon[2] (*Figure 1*) George Tryon was born at Bulwick Park Northamptonshire on the 4th January 1832 He was educated at Eton and joined the Royal Navy at the age of sixteen He was a colourful and charismatic figure zealous and full of life and energy By 1893 he was at the pinnacle of his career and was looked upon as the most outstanding naval officer of his day having been appointed in 1891 to the senior sea going command of the world's largest navy as Commander in Chief of the Mediterranean Fleet In this position he was well placed to put into practice his revolutionary theories especially an unorthodox supplementary system of signalling known as TA whereby once the code flags TA were raised the ships of the fleet would simply observe and copy the flagship's own movements It was Tryon's belief that this would almost always be what was required of a fleet in action This was designed to drastically speed up communication and encourage initiative among his captains There was something in him that inspired his subordinates with confidence in every order and direction that he gave.[3]

Rear-Admiral Albert Hastings Markham[4] (*Figure 2*) Albert Markham was born at Bagneres de Bigorre in the Pyrenees on the 11th November 1841 He was accepted as a cadet into the Royal Navy at the age of fourteen and was initially sent out to the China station taking part in many actions against pirates He later developed a taste for Arctic exploration and

Fleet into columns of two divisions and then invert the course of the columns by turning inwards 16 points (i e *through 180 degrees*) leaders together the rest in succession He would also place the columns six cables (*twelve hundred yards*) apart for this manoeuvre Hawkins-Smith then remarked that the columns should be eight cables apart for this (seeing that the *Victoria* s turning circle was three cables and that the combined turning circles of the *Victoria* and the *Camperdown* were not less than eight cables) To this the Admiral replied Yes it shall be eight cables and the Staff Commander then left for the fore bridge with his charts

Tryon then summoned his Flag-Lieutenant Lord Gillford and told him Will you make a signal to form columns of divisions line ahead columns disposed abeam to port and make the columns six cables apart handing him a piece of paper on which he had scribbled the figure 6 to emphasise this point When this signal was flown it was seen by Hawkins Smith who knowing the Admiral had expressed his intention to separate the columns by eight cables thought that the Flag Lieutenant had either made a mistake or that the Admiral had momentarily forgotten his intention The Staff Commander therefore asked the Flag Lieutenant to check this distance with the Admiral Lord Gillford went down to Admiral Tryon s cabin finding Captain Bourke still with the Admiral and said The Staff Commander asked me to remind you that you had agreed to eight cables sir You certainly said it was to be more than six cables sir added Bourke anxiously

To which questioning of his orders the autocratic Admiral replied Leave it at six cables And so the signal remained and the Fleet positioned itself accordingly

As the Fleet entered the bay of Tripoli the signals to reverse course were prepared There was no single signal in the book to cover the evolution Tryon had planned and it had to be made as two separate orders one to each column Thus at 3 25 pm the *Victoria* s yeoman sent on the following

Second Division alter course in succession 16 points to starboard preserving the order of the fleet

and *First Division alter course in succession 16 points to port preserving the order of the fleet*

Upon the *Camperdown* delayed in acknowledging this signal implying that Admiral Markham had not understood it Tryon therefore ordered the yeoman to semaphore to the *Camperdown What are you waiting for ?* and to show her pendants as a public rebuke Almost immediately the *Camperdown* signalled her acknowledgement and at once the *Victoria* s signal was made executive by being hauled down

The collision (*Figure 3*)

The next few minutes are best depicted by some of the words of John W Sherwell in his poem The *Victoria* In Memoriam June 22 1893 which appeared in the United Service Gazette two weeks after the tragedy

Ploughing the blue in their columns of battle
Never a thought there of aught of disaster
Till by mischance that was fearful and fatal
Bore down the *Camperdown* — bare down to order
From the *Victoria* — ought to have passed her
Bow-on the *Camperdown* came full weigh toward her
Struck her to starboard full on her fore turret
Struck with a thunderous shock and a shiver
Then backed from the blow with a tremorous quiver
Of shame for the involent deed
God help them all there in the hour of their need!

But twas over in a moment — though all through the time
Whirled the blades of her screws to a murderous rhyme
And the furnace flames flew in a fiery thirst
And her steam towers roared as though they would burst
With her stokers and engine men prisoned beneath
Doing in death in the vaporous breath
Till her bow went from under us over she swung
And the knell of three hundred seamen was rung!

THE COURT MARTIAL [1]

The court martial which assembled on board Her Majesty s Ship *Hibernia* at Malta on the 17th July 1893 and sat until the 27th to inquire into the loss of the *Victoria* went most exhaustively into the subject and examined as witnesses all the survivors who could throw the smallest light upon the disaster It was presided over by Admiral Sir Michael Culme Seymour the new Commander in Chief of the station Captain A L Winsloe of HMS *Hawke* was sent out from England to act as prosecutor

October 1902 she was sold for scrap and many of her heavily painted wooden timbers were sold to Maltese bakers who at the time used very primitive ovens The next year a widespread mysterious acute illness broke out amongst the population This was soon diagnosed as lead poisoning and the source was traced to the timbers of the *Hibernia* This epidemic has been fully described in a previous issue of this Journal[5]

The Protagonists

Admiral Markham Markham was the most important witness at the court martial for it was felt that he was unofficially as much a defendant as Bourke When asked how he had interpreted the signal to turn hoisted on the *Victoria* and to explain his delay in acknowledging the signal it became painfully evident under skilful cross examination that he was bewildered by the signal and that he had remained confused and uncertain even after acknowledging under the pressure of Tryon s subsequent rebuke that he had understood it On receiving this acknowledgement the *Victoria* had made the order executive and had immediately put her helm hard over The *Camperdown* had then begun her turn on a slightly wider arc towards the flagship and only then had she semaphored a response to Tryon s demand *Did not quite understand the signal* [1] Markham argued that he had interpreted the signal as meaning He must be going to circle round us passing us on the port hand [1] thinking that there could be no other interpretation and that he had therefore attempted to circle within the turn of the *Victoria* aiming to cut across her bows

The evidence of Markham s Flag Captain Charles Johnstone and of his Flag Lieutenant was also unsatisfactory and contradictory and the Court was left with the feeling that the *Camperdown* had been rather badly handled

Admiral Tryon Admiral Tryon s last words as remembered by two senior officers of unquestionable integrity determined the final verdict of the court martial Tryon s Flag Lieutenant Lord Gilford who had queried the original distance of six cables was questioned by the Prosecutor Did you hear the Admiral at any time after the collision pass any remark as to whom if anyone he blamed for having caused it or suggest any reason for its cause To this Lord Gilford replied after hesitating The Admiral said *It was all my fault* Later the Prosecutor asked Tryon s Staff-Commander Thomas Hawkins-Smith Who remained on the bridge after the collision? and Hawkins Smith replied that only he and Lord Gilford had been left with Tryon There was no conversation but he made use of an expression he volunteered He said *It is entirely my doing entirely my fault*

The findings

The pertinent findings of the court martial were as follows

1 The Court finds that the loss of Her Majesty s Ship *Victoria* off Tripoli on the coast of Syria on the 22nd day of June 1893 was caused by a collision with Her Majesty s Ship *Camperdown* and it is with the deepest sorrow and regret that the Court further finds that this collision was due to an order by the then Commander in Chief the late Vice Admiral Sir George Tryon to the two divisions in which the fleet was formed to turn sixteen points inwards, leaders first the others in succession the columns at that time being only six cables apart

3 The Court finds that no blame is attributable to Captain the Hon Maurice Archibald Bourke or to any other of the surviving officers and ship s company of Her Majesty s Ship *Victoria* for the loss of that ship and doth therefore acquit them accordingly

4 The Court feels strongly that although it is much to be regretted that Rear Admiral Albert Hastings Markham did not carry out his first intention to semaphore to the Commander in Chief his doubts as to the signal it would be fatal to the best interests of the Service to say he was to blame for carrying out the directions of his Commander in Chief present in person

Thus the Court dealt with the urgent public need to identify a culprit by settling the blame for the disaster and the loss of life fully onto Admiral Tryon who with true poetic justice was deemed to have paid the price with his life and also with his reputation The most charitable and widely held conclusion then and since has been *Humanum est errare*

Professional ruin of Markham

There was however considerable astonishment at the leniency shown to Markham by the court martial This following considerable agitation by influential officers the Admiralty reviewed the proceedings and findings of the court-martial publishing on Admiralty Minute on the 29th

to widespread speculation (which has persisted to this day) that Tryon had in fact been suffering from Mediterranean or Malta Fever — the causative organism of which had only just been discovered by Surgeon Major David Bruce in 1886 [3] but whose mode of spread was still unknown. It was after all well known that the other main protagonist involved in the tragedy

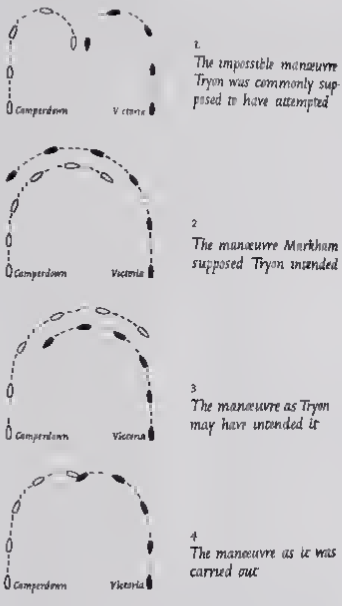

Figure 4 Interpretations of Tryon's Signal (courtesy of White Lion Publishers)

CONCLUSION

In the perceived opinion of the time rightly or wrongly the loss of the Royal Navy's mightiest battleship and most famous naval officer was inextricably linked to the mysterious microbe of Malta Fever now known as Brucellosis. This drew worldwide attention to the havoc this illness was causing to the Mediterranean garrisons and thereby played a catalytic role in the institution eleven years later of the Mediterranean Fever Commission which succeeded in identifying goats' milk as the vehicle of infection.

Lest we lose sight of the scale of the human suffering and loss in life at this disaster, let us recall the reaction of Queen Victoria who had been more closely associated with the *Victoria* than with any other battleship in her Navy on receiving the news at Windsor. She at once despatched a message to the First Lord of the Admiralty Lord Spencer expressing her deepest grief. 'Our heart bleeds for the many homes which have been plunged into mourning and deep affliction by this dreadful misfortune.'

At least the crew of the *Victoria* did not die in vain for the attention thereby drawn to Malta Fever ultimately led to its eradication. In this centenary year it is therefore fitting to conclude with John W Sherwell[7]:

> Then honour them all
> *In aeterna memoria*
> They that went down in the hapless *Victoria*

ACKNOWLEDGEMENT

I am indebted to my father Dr Luis Vassallo for alerting me to the controversy surrounding this naval tragedy and for his encouragement and help with criticism of this article.

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abundance of vegetables for the use of the sick and that if lemon and orange trees were planted the Fleet on the Mediterranean station might be amply supplied with the antiscorbutic fruit

Scurvy was only eradicated from the British Navy after 1804 though it recurred when lime juice replaced lemon juice during long voyages limes having only half the amount of ascorbic acid per 100 g of raw fruit as lemons or oranges The first controlled experiment from which our present knowledge of ascorbic acid derives was made in 1753 by Dr James Lind who showed that scurvy could be cured by giving patients this fruit During his voyages round the world between 1772 and 1775 Captain Cook kept his ship s company free from scurvy by giving them abundant fresh food Scurvy was produced experimentally in guinea pigs in 1907 and ascorbic acid was isolated from lemons in 1932 with its structural formula being worked out in 1933 leading to its synthesis the same year

BREAD AND FLOUR

One staple item of the sailor s diet in the early nineteenth century was the ship s biscuit or hard tack since the baking of fresh bread at sea was considered impractical by the British naval authorities until the middle of the nineteenth century This food was frequently heavily contaminated by weevils

Malta featured indirectly in the history of fresh baking of bread abroad In 1845 one Henry Jones proprietor of the Western Biscuit Bakery in Bristol took out a patent for making self raising flour He subsequently sent 30 sacks of this flour as a sample to the Victualling Office for trials abroad but there appeared to be little response He then invented a simple machine for preparing flour on board ship This was put on the *Porcupine* for a trial and a favourable report was made two years later However the Admiralty declined the offer to purchase the machine In 1849 Jones asked for the machine to be returned to him and was informed six years after he had originally sent the machine that it had been traced to Malta where it had been destroyed Compensation was only made after continuous pressure by Jones Henry Jones Patent Flour — the original self raising was only adopted by the Admiralty Victualling Office after the Crimean War

FEVER

Scurvy and fever march together throughout the naval history of the eighteenth and nineteenth centuries Both [illegible] called forth the extremes of human misery the one weakening the body so that the latter could easily take hold The fevers affecting the Mediterranean fleet landing in Malta during the first part of the nineteenth century were described by William Burnett In his account published in 1816 Burnett describes a number of fever epidemics which occurred in British ships The first reported episode of fever in Malta dated to May 1799 among the crew of the ship *Goliath* Another episode was reported during the summer of 1800 in the *Athemai*

Burnett described this fever to the crew s exposure to the sun and by no proper use of the lancet in the early stages joined by purgation they all speedily recovered none died nor was sent to the hospital during two years During his term of office as Physician to the Mediterranean Fleet Burnett reported on fever epidemics in the *Eagle* (December 1810) when fever of a typhoid nature affected 60 of the crew who were admitted to the naval hospital where all recovered following repeated bleeding purgation and epigastric blistering in the *Alceste* and the *Scout* when there was fever involvement of abdominal viscera and frequent stools and in the *Pomone* and *Weasel* (June 1911) when there was deep yellow suffusion of the skin vomiting epigastric pain loin and lower limb pains Burnett further reports that during the period 1 April to 23 May 1812 153 men from the *Victorious* and the *Trident* were treated in the naval hospital for fever with eight fatalities In a further publication Burnett records for the first time the clinical picture of undulant fever although he refused to distinguish between one fever and another all of them in his opinion being malarial in character In line with prevalent thought Burnett advocated energetic or active treatment Venesection certainly had pride of place in his system on one occasion he boasts of taking 90 oz of blood from the temporal artery in six hours on another since the patient was strong and vigorous 16 lb of blood was taken in eight days He believed also that yellow fever was merely a malignant form of malaria and that treatment should consist of bleeding and purging postponing the use of quinine if used at all to the later stages of the disease[4 5]

The aetiological cause of these fevers was believed by Burnett to be due to the influence of offensive exhalations or miasma arising from marshy ground — hence mal aria He wrote that it had been observed that ships fitting out at the dockyard at Marsa were more subject to attacks of fever than those lying out at their

TYPHUS

Typhus was the inevitable concomitant of cold undernourishment overcrowding dirt and misery — conditions which prevailed wherever men's clothes were lousy and their constant companions were rats and was during the early nineteenth century one of the most prevalent killers of seamen although not then endemic to the Maltese islands. It was first reported in Malta in 1855 56 during the Crimean War when a soldier from the war area died a hospital attendant died from the infection the diagnosis being made on the basis of the post mortem findings. Another episode occurred in April 1861 when an Egyptian vessel with several cases on board entered Grand Harbour however the infection was contained. In 1920 a number of cases were reported from the ship *SS Panama* which docked in Malta. A number of the cases were hospitalised in Malta but the quarantine measures adopted were sufficient to prevent the spread of the disease. The infection became endemic to the Maltese islands following the typhus epidemic which occurred in October 1944[9].

TUBERCULOSIS

Tuberculosis has until recently been considered an occupational disease of seamen although it was not considered important before the nineteenth century. In the early years of the nineteenth century it was commonly believed that the Mediterranean climate was less conducive to pulmonary disease indeed it was the custom for consumptives to travel to the area for a cure. While serving as surgeon of the *Medusa* in the Mediterranean in 1852 Spencer Wells reported that during the previous decade he had noted that an average of 24 post mortems per year showed evidence of the disease accounting for 37 7% of the deaths of sailors. The corresponding figure for soldiers was 32% and for the civilian population 12%. Spencer Wells made an urgent plea for improvements to the ship's ventilation which was then dependent on windsails and hatchways recommending the use of Lieutenant Gilmore's canvas air funnels. His suggestion was refused on the grounds that the *Medusa* was too small. The problem of tuberculosis in sailors has prevailed well into the twentieth century.

VENEREAL DISEASE

Venereal disease was extremely prevalent in the Navy during the eighteenth and nineteenth centuries the high rate of incidence being undoubtedly due to the traditional habits of sailors and the conditions prevailing in the ports. The situation was no different in Malta. After the arrival of the Knights of St John the islands became a maritime centre and by 1551 Vittoriosa had become notorious for the number of Maltese and foreign prostitutes living there. Venereal disease was not uncommon its treatment being carried out at the falanga at the back of the Great Ward of the Sacra Infermaria by mercurial inunction and hot air baths. Legislation measures were devised to discourage and restrain prostitution including the enforced periodical medical examination of prostitutes — a practice that was introduced during the Order's rule and maintained during the first half of the nineteenth century under the British. By 1830 more than 150 women were being examined each month. As some of the women declined to submit to such an examination an ordinance was enacted in 1861 enforcing the compulsory examination of prostitutes and the treatment of infected ones in hospital where they were to be detained until they were declared cured. This system was considered so effective that the desirability of introducing similar measures elsewhere was raised in 1864 by a British Parliamentary Committee under the chairmanship of F C Skey. This committee was contemporary with the passing of the First of the Contagious Diseases Acts which laid down that women must submit to compulsory examination if information was laid against them provided that they resided in specific places in the United Kingdom where army or navy personnel predominated. The Skey Committee Report published in 1867 recommended the introduction of compulsory examination of prostitutes in all big ports and also recommended the compulsory examination of the genital organs of all service personnel [10].

CHOLERA

Cholera made its first definite appearance in the Maltese Islands in 1837 though sporadic cases were said to have been observed among British troops every year during the previous decade. During the 1837 epidemic which lasted from 9 June until 10 October 62 Naval cases and five deaths are recorded. A total of 8 785 cases are known to have occurred in Malta and Gozo with 4 252 deaths. The islands subsequently became notorious for epidemics of the infection throughout the nineteenth century with further outbreaks occurring in 1848 1850 1856 1865

prevailing there might also have been contributory remarking that in Malta scarcely any person is exempted from rupture[1]

CONCLUSION

The Maltese-British Navy connection had two facets to its story with a give and take relationship On the negative side the role of the island as a Mediterranean link between the Indian and Atlantic Oceans served to aid the introduction of infectious epidemics to the island some of which have remained endemic On the other hand both Maltese and British medical practice gained from the relationship the British Navy ensuring that a number of enterprising young medical practitioners visited the Island leaving in many instances an indelible mark on local practice Not the least of these was Thomas Spencer Wells who introduced anaesthesia in Malta Furthermore the efforts of the British Naval authorities to combat the debilitating diseases affecting their sailors helped in the control and management of infectious disease particularly smallpox The Island on the other hand contributed towards the understanding of the value of a rigorous system of quarantine and of the rigid control of venereal disease by measures introduced in Malta by the Knights of St John

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a dental role seemed to amuse them. I finished up with a wonderful stainless steel electrically heated vulcaniser — it must have cost the earth!

From this experience I learned of the vast resources of the various government laboratories which served me in good stead after I had retired from the Navy and worked at the Ministry of Health where I was able to steer dental projects through the research establishments of the Government Chemist Porton Down and Aldermaston.

The design for the shallow diving masks was altered shortly after this so we used the electric vulcaniser to good purpose by providing tailor made mouth guards for the Portsmouth Command boxing team. They were very successful and for some time none of our boxers was knocked out by a point blow to the chin but they were eventually frowned on by the physical training instructors because the boxing experts came to the conclusion that the boxers could suffer too much punishment from head blows while the mouth guards were being worn.

During my appointment at Plymouth I had visited all the dental schools in the United Kingdom on a recruiting mission and as a result of this I was on christian name terms with their Deans. On reading in the *British Dental Journal* that Professor Geoffrey Slack at the London Hospital Dental School required information on adults who had perfect dentitions ie those who had no fillings or extractions and showed no visible disease of their alveolar tissues I offered to institute a trawl throughout the Royal Navy. My fellow RN dental officers were most co operative and we finished up with over 20 individuals who fitted his requirements. Geoffrey had asked for a questionnaire on eating and cleaning habits for each patient. I asked him to lunch and we went through the questionnaires seeking a common factor but some liked meat vegetables fats fruit sweets — and some didn't. Some brushed their teeth with an up and down motion some preferred side to side and some a rotary scrub. Some brushed in the morning some at night while others said they brushed after every meal(!) and one or two didn't believe in brushing their teeth. Some liked soft brushes some hard. However it was noticed that in all the models there were signs of crowding of the canine and incisor teeth — all were very close together and it was to this common factor that freedom from caries and gum disease could well be attributed.

Years later after I had retired from the Navy and was employed by the Ministry of Health Geoffrey had accepted the appointment of Honorary Consultant Adviser and he was a great help to me in laying down the acceptable very strict parameters for the dental inspections required for the Dental Health Survey in England and Wales in 1968. The Survey was the first of its kind in the world and with the same parameters was repeated in 1978 and 1988.

Another bit of fun I had was with the precursor of the present video cassette. I wanted to standardise the official obligatory dental lecture to new entries in the RN and RM teenage training establishments and I believed that something to laugh at was most likely to produce more co operative patients for the Royal Naval dental officers who treated them.

I wrote a script and engaged a comic strip artist to draw pictures which illustrated the points I hoped to make. The coloured drawings were then converted into lantern slides which could be led into a remotely controlled carousel slide projector. The recording studio wished to employ a professional actor to read the lecture but it was decided that I was likely to do it better because I had written the script. I went to a recording studio in Wardour Street and spoke my piece which resulted in a mould for a 24" gramophone record. We had no rehearsal — I apparently got it right first time but I still think the professional recordists were laughing too much to ask me to do it again.

I demonstrated this technique to an amused British Dental Association Committee investigating publicity methods for dentistry under the chairmanship of Professor Alex McGregor the Dean of the University of Birmingham Dental School.

Surgeon Commander Edmondson was in charge of the laboratory at RNMS when I arrived there. We had previously served together at RN Hospital Plymouth and become great friends. Ed was a bachelor and lived in a caravan parked in a discrete corner of the RNMS grounds. He was doing some work at the Medical Research Council Radiobiological Research Unit which was part of the United Kingdom Atomic Energy Research Establishment at Harwell and one day early in 1958 he invited me to go there with him. We had lunch in the canteen where he introduced me to Robin Mole the Deputy Director of the MRC Unit. After lunch Robin sought me out and showed me an autoradiograph of a monkey's jaw. We discussed it and I appreciated that there were special dental problems for which answers were required.

I rang him up the next morning and suggested

Association of Service Physicians

The Thirteenth Annual Meeting of the Association of Service Physicians was held at the Royal Army Medical College, Millbank on 19 February 1993 and was attended by forty seven members and guests.

Air Commodore D H Hull Consultant Adviser in Medicine Royal Air Force took the chair for the first session. In the first paper Surgeon Lieutenant Commander C D Gillen gave details of a study in Birmingham into the risk of developing colorectal cancer in patients with Crohn's Disease and Ulcerative Colitis. This study indicated that the risk of developing colorectal cancer after 20 years or more of illness is as great in patients with extensive Crohn's colitis as in those with extensive ulcerative colitis. Young age at onset is an important risk factor in both diseases. The absolute numbers of Crohn's patients who develop colorectal cancer is relatively small as many undergo early surgical excision for symptomatic disease. In the second paper Surgeon Commander R W Smith gave details of a clinical and pathological study of Chrysiasis a slate grey bluish discolouration of the skin occurring in patients receiving gold therapy for rheumatoid arthritis. It appears to affect mainly the upper face and to develop when the cumulative dose of gold exceeds 45 mg/kg. The effect appears to be mainly cosmetic and may be confused with the skin discolouration of dermatomyositis and Amiodarone therapy. In the third paper Squadron Leader K P McKinlay described the acute and chronic effects of Mustard Gas exposure as seen in a small number of soldiers exposed to mustard gas in the Iran Iraq war who were subsequently treated at the Brompton Hospital. These patients developed progressive breathlessness recurrent chest infections and chronic cough following acute exposure and were shown to have bilateral bronchiectasis for which there was no other obvious cause. This has not previously been reported as a long term complication following acute exposure.

The second session was devoted to a Tropical Medicine Update given by four distinguished guest speakers who were introduced by the Director of Army Medicine Brigadier C D Cowan. In his talk on diarrhoeal illness Professor M J G Farthing stressed the persisting high mortality of these illnesses even in developed countries particularly in children. He described the exciting research into the roles played by 5 HT and ZOT (zona occludens toxin) in the development of diarrhoea provoked by cholera toxin and the encouraging therapeutic effect of some 5-HT antagonists. He mentioned the progress towards developing an oral cholera vaccine work on Rotavirus vaccines is less advanced. He also described developments in the use of hypotonic glucose electrolyte solutions for oral rehydration therapy and the addition of rice based or polymer mixtures to thicken and improve the efficacy of these solutions. Dr G C Cook then gave a rapid and concise review of the major worm infestations and their treatment drawing attention to some areas of concern such as the development of resistance of some strains of Schistosomiasis to Praziquantel. The expense of many of the newer antihelmithic preparations continues to limit their widespread use in poorer countries. Following this Dr A D M Bryceson gave an equally concise and comprehensive review of the current world distribution of Leishmaniasis in its differing forms and drew attention to its worrying co existance with and potentiation by HIV infection in certain areas especially Southern Europe. Sodium Stibogluconate remains the mainstay of treatment though Pyromomycin and Amphotericin are also useful. The toxicity of Amphotericin can be reduced by infusion with lipid. Finally Professor J A Wartel discussed malaria concentrating on Falciparum infection its varied forms of presentation and optimum treatment. Quinine remains the drug of choice including during pregnancy. Chloroquine resistance was discussed briefly (including the appearance of some resistant Vivax strains in the Far East) and also the work suggesting restoration of sensitivity by combining treatment with calcium channel blockers. The meeting concluded with lunch in the RAMC Headquarters Officers Mess.

(*The authors were* invited [illegible])

Sir

An audit of resuscitation and anaesthesia during Operation Safe Haven

We welcome the comments made by Surgeon Commander James supporting the need for sophisticated laboratory equipment and adequate blood storage facilities within the SST organisation while counselling on the risks of on site donation We were very aware of these risks

The SST deployed to Kurdistan with one Thermopol capable of storing 30 units of blood Re supply through the nearby airstrip was designed to be within three days of request Because we received multiple cases of severe trauma all reserves of stored blood were drained on two occasions before new stocks could arrive Only in these extreme circumstances were the recognised complications of on site donation accepted and fresh whole blood utilized in preference to crystalloid or colloid

Coagulopathy occurs most frequently in the severely traumatized hypothermic patient[1] and can be prevented by efficient warming despite massive transfusion Many of our patients in Iraq suffered a significant drop in core temperature because of inadequate facilities for warming intravenous fluids despite the high ambient temperatures We therefore assumed the presence of coagulopathy Accepting the objections raised fresh whole blood supplies coagulation factors which are deficient in stored blood carries oxygen more efficiently and is warm

We agree that blood should never be heated above 37°C and have already stated that when using simple warm water baths temperature must be strictly controlled This requirement should not preclude such a straightforward effective and simple technique of preventing hypothermia during massive transfusion in the field

If the SST were adequately equipped for blood storage fluid warming haematological and biochemical assessment then there would be no need to debate techniques and interventions that should ideally never need to be used We agree with the 1992 NATO consensus on the treatment of coagulopathy in the field but note that as the SSTs are not equipped for 3rd Echelon care the problems we encountered are likely to recur unless the solutions we have suggested are adopted

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Trainee in General Practice

S Q M TIGHE MB BD FFARCS
Surgeon Commander Royal Navy
Consultant in Anaesthetics

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Dear Sir

The recent emergence of ATLS[1] as the guiding principle behind trauma management in the United States and the United Kingdom has led to major changes in protocol in many accident and emergency departments

The ATLS program is concerned with the immediate management of trauma victims particularly in the first hour (the so called Golden Hour) of treatment The traditional ABC of immediate care is altered and augmented slightly with care of the cervical spine introduced early into the scheme The Primary Survey of ATLS is

Airway with cervical spine protection
Breathing
Circulation with control of life threatening haemorrhage
Neurological Disability
Total Exposure

Thus all patients are assumed to have cervical spine injuries until proven otherwise and all airway manipulations are performed with full cervical spine protection This may be afforded in one of two ways *either* manual in-line immobilisation *or* a combination of rigid cervical collar sandbags and tape placed across the forehead *Anything* short of these two alternatives is inadequate In addition no patient is moved without particular care of the spine being taken including log-rolling

First Aid teams on Royal Naval ships are trained in accordance with ABC principles[2] but up to now no particular import has been placed on the care of potential spinal injuries during the ABC sequence Indeed no particular import is placed on the cervical spine at all The equipment scale of medical supplies for RN ships from CVS down does not include equipment for immobilising the cervical spine properly such

shonld be altered to include the correct eqnipment for immobilisation of the spine especially semi rigid cervical collars This is partienlarly important as an increasing nnmber of Royal Naval medical officers are ATLS trained and the Service has accepted the raqnirements for ATLS training of doctors and has agreed to sponsor regnlar ATLS conrses at the Institnte of Naval Medicine

It may be of interest that the Royal College of Surgeons of England nnder whose anspices ATLS conrses are rnn in the United Kingdom have recently taken on the organisation and have introdnced Pre hospital Tranma Life Snpport Courses to this country These courses are specifically designed for paramedics and other pre-hospital carers involved in the management of trauma victims as opposed to ATLS which is specifically for qualified doctors As yet I have not been able to study the course contcat but I nnderstand that the aim is to ensnre the provision of care conforming to ATLS principles at the site of injury and throughout transfer to hospital I am snre that the core material for this course could be considered as a basis for modification of the trauma related aspects of Royal Naval Medical Branch training

It should be noted that Reference 1 to the letter is incorrect it should read Advanced Tranma Life Support Course Core Course 1988 American College of Snrgeons An npdated ATLS core content has been agreed and is dne to be pnblished in September 1993

Yonrs sincerely

C J CAHILL

(*Editorial note* It should perhaps be pointed out to Messrs Stoneham and Tighe that they are also a little ont of date with their other two References First Aid Training in the Royal Navy has recently been npdated and the 1992 revision is currently in use and the First Aid Manual of the St John Ambnlance is currently at the 6th Edition of November 1992)

Dear Str

Whilst in no way wishing to detract from the work carried out by the Medical Librarian at Haslar I feel that his article in the Spring 1993 issue of the Journal gives the impression that prior to 1986 there was not a recognisable medical library in Haslar

A separate Medical Library was created in 1964 when historical and current textbooks were separated Without this modern library the various Royal Colleges wonld not have given their recognition to the postgraduate training carried ont at Haslar

It was there during 1963 to 1985 that many of the services offered today were introduced for example the first photocopier in Haslar was in the Medical Library Inter-library loans Union catalogue of MOD holdings Wessex Regional catalogue of periodicals microfiche readers and a display of cnrrent jonrnals in alphabetical order are just a few of the changes I initiated

Whilst a believer in credit where credit is dne I wish the present medical Librarian every success in the future

C T PARSONS
Former Medical Librarian
RNH Haslar

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lines The ABC approach is used but a more expanded section is called for to cover this crucial topic It was good to see specific and excellent sections on the limping child and the management of children brought in dead There are very good chapters on burns and inhalation poisoning and ingestion as well as on abuse and NAI where surely photographs are essential There are useful separate chapters on parental anxieties and legal aspects both of which are not uncommon and can provide difficulties for an inexperienced junior doctor Highly recommended reading for all GP trainees and SHOs about to embark on their Accident and Emergency Department attachments It is inexpensive and good value

MS

Oxygen and the Diver K Donald Pp 240 SPA Ltd December 1982 £14 95

It comes as something as a shock to the uninitiated that oxygen at raised partial pressure can be highly toxic This monograph is largely devoted to an explanation of this phenomenon as it affects divers It is a long overdue review of the subject and although much of the work reported in this 240 page hardback volume has been published previously too much of it has rested undisturbed in historical references or inaccessible reports If the author had done no more than collate the work in this highly readable volume it would be worthy of praise However Donald's contribution is far greater than this Through his substantial contribution to research into the use of oxygen in diving not only has he employed his insight to interpret the available literature but he has gone to the trouble of publishing this book himself For that all who are involved in diving and diving medicine are indebted to him

With World War II the requirement arose for divers to be able to travel underwater covertly To achieve this a means of avoiding the release of bubbles of exhaled air was required The use of pure oxygen as the breathing gas was an obvious choice However prior to 1942 little was known about the toxicity of oxygen particularly in man The human experiments described in Chapter 2 which were undertaken by the Royal Navy in a remarkably short period laid the foundation for determining the safe limits for exposure to O which permitted the operational use of oxygen diving In today's ethical climate it is unlikely that this work could be repeated This report apart from its historical interest will therefore be invaluable to researchers in the future Other chapters cover more recent work on oxygen toxicity some of the problems associated with mixed gas diving and variations in divers physiological responses to carbon dioxide It is therefore a book of general interest to the diving physician

No review of this book would be complete without reference to Appendix 1 in which the author relates the circumstances under which he became involved in diving medicine research It makes fascinating reading and is a delightful account of how applied research can overcome operational constraints I was left wondering if the flexibility of appointing tasking and finding which pertained at the time contributed to the fantastic productivity of a small group of researchers? If it did let us hope that the potential rigidity of NMS will not impede the flair of Donald's successors should it ever again be required with such urgency

TJRF

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Queen Alexandra's Royal Naval Nursing Service

Kathleen Harland MA

This book was commissioned to be written by Kathleen Harland for the QARNNS Centenary celebrations in 1984. The high cost of publishing and corresponding lack of funds put the project into abeyance until it was brought to the attention of the Editorial Committee of the Journal of the Royal Naval Medical Service. Only through the financial backing of the JRNMS, who have acted as publishers, has it been possible to print the book.

Mrs Harland has written a comprehensive account of the history of QARNNS from their inception in 1884 up until 1988. It is a book which combines history, general interest and some anecdotes in an easy to read style. She relates the initial antipathy to females being attached to the Royal Navy, the conditions under which some QARNNS Officers served in WW2 and describes the trials of service during the Korean War and latterly the effect of the Falklands War. The book will be of interest to historians in particular the comprehensive tables at the back of the book which cover a diversity of subjects including Honours and Awards and Establishments where QARNNS Officers have served. A wide selection of photographs provide contrast and further interest for those people who may prefer just to browse through the pages.

The book costs £8.50 which includes postage. For those who can collect direct from the Office of Surgeon Commodore (NMT) the cost will be £7.50. To order a copy of the book you are requested to complete the form below and send to: ISTO, Office of Surgeon Commodore (NMT), Monckton House, Institute of Naval Medicine, Alverstoke, Gosport, Hants PO12 2DL.

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SERVICE NEWS

ROYAL NAVAL MEDICAL AND DENTAL OFFICERS

APPOINTMENTS AND PROMOTIONS

To Surgeon Rear Admiral and appointed SRA (SMS)
22 April 1993
Surgeon Captain A Craig

As Queen's Honorary Surgeon
17 April 1993
Surgeon Commodore A M Hazell

As Queen's Honorary Dental Surgeon
12 April 1993
Surgeon Captain (D) E J Grant

As Consultant Adviser in Oral Surgery to MDG (N)
1 March 1993
Surgeon Commander (D) J V Holland

To Surgeon Lieutenant Commander
D B Macleod

To Surgeon Lieutenant Commander (D)
A Gow M J Hain K F Pilgrim

To Surgeon Lieutenant
M Every H D Wilhams

To Acting Surgeon Lieutenant
A N Bowie

HIGHER QUALIFICATIONS

Surgeon Commander P Jones — DIH
Surgeon Lieutenant Commander S C Sheard — MFOM
Surgeon Lieutenant Commander A W Murrison — AFOM
Surgeon Lieutenant Commander C D Gillen — DTM&H

ATTAINMENTS BY JUNIOR DOCTORS

Surgeon Lieutenants D A Jones and A R Bailey have passed FRCAnaes Part II

Surgeon Lieutenants A J Hudson and P A Mançais have passed MRCP Part I and Surgeon Lieutenant D J A Price has passed MRCP(U) Part I

TRANSFERS TO FULL CAREER COMMISSION

Surgeon Commander D V Lunn
Surgeon Lieutenant Commanders R F Stf Gent C J A Edwards S D Evans R W J Haddon M H Lygo
Surgeon Lieutenant Commander (D) D J Hall
Surgeon Lieutenants D J Summerton C J Hand R M Freece
Surgeon Lieutenant (D) C D J Redman

CONSULTANTS SENIOR SPECIALISTS AND SPECIALISTS

The following professional advancements are announced

Specialists
Surgery
Surgeon Lieutenant Commander A W Lambert
Occupational Medicine
Surgeon Lieutenant Commander A W Murrison
Accident and Emergency
Surgeon Lieutenant Commander M A Howell

NEW ENTRIES

Surgeon Lieutenants M W Farrar A C Palmer
Surgeon Sub Lieutenants J J Matthews D E B Ayers

PLACED ON EMERGENCY LIST

Surgeon Lieutenant Commanders S J Robinson F W King Lewis
Surgeon Lieutenant Commander (D) C M Elrick

RETIREMENTS

Surgeon Commodore (D) B Robinson
Surgeon Commander A Yates

NEWS OF RETIRED OFFICERS

Professor Sir Norman Blacklock OBE has been invested by the Queen on 7 May 1993 as a **Knight Commander of the Royal Victorian Order (KCVO)**

MEDICAL SERVICES

AWARDS

Petty Officer Medical Assistant C Checkley has received the **Queen's Commendation for Brave Conduct** for his action during a switchboard fire aboard HMS *Turbulent* on 30 April 1992. POMA Chenkley is now serving in HMS *Trenchent*

APPOINTMENTS AND PROMOTIONS

As Officer in Charge
Royal Naval Medical Staff School
6 September 1993
Commander G Marshall

To Lieutenant
W M Durning P L H Chilcott

Provisional Selection for Promotion to Warrant Officer to date 31 March 1994
C Jones

NEW ENTRIES

Sub Lieutenants A D Blocke T H C Bradford

HIGHER QUALIFICATIONS

Lieutenant Commander M Wagstaff has been awarded an MBA. Lieutenant I Coulton has gained the Diploma in Management Studies and Lieutenant Commander K Edwards has gained an MSn

QUEEN ALEXANDRA'S ROYAL NAVAL NURSING SERVICE

APPOINTMENTS AND PROMOTIONS

To Senior Nursing Officer
M E Proulx

NEW ENTRIES

Senior Nursing Officers C J Hall H K Wilford
S A Pike
Nursing Officers Z S Thompson P M Harusworth

HIGHER QUALIFICATIONS

Senior Nursing Officer A Dobson has been awarded a BA at the Open University

RETIREMENTS AND RELEASES

Superintending Nursing Officer C A Morris
Senior Nursing Officers J E Snape A J Nutbrown

ROYAL NAVAL RESERVE

PROMOTIONS

To Surgeon Lieutenant Commander
J M Norwood — *Flying Fox*

To Lieutenant Commander
P J Langley — *Southwink*

NEW ENTRY

Surgeon Lieutenant Commander K P Bryen — *Northwood*

PLACED ON RETIRED LIST

Surgeon Captain J M M Walsh — *Sussex*
Surgeon Lieutenant Commander R D Rawlins — *President*
Surgeon Lieutenant Commander D Bareford — *Forward*

REMOVED FROM ACTIVE LIST

Surgeon Lieutenant Commander
J M C Ward McQuaid — *Ceres*

RESIGNATIONS

Surgeon Lieutenant Commander D J Makepeace — *Eaglet*
Surgeon Lieutenant I Mellor *Completion*

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Contents

Notice to Authors

Contributions should be submitted to the **Editor, Journal of the Royal Naval Medical Service Institute of Naval Medicine Alverstoke, Hants PO12 2DL** who will arrange for any necessary security clearance. The attention of Medical Branch personnel is drawn to the provisions of QRRN Annex 68A para 6a.

Manuscripts should be prepared in the Vancouver style[1]. They should be typewritten with double spacing and wide margins and should include title page, abstract (of not more than 150 words), introduction, method, results, discussion and references, each section commencing on a separate page. A convenient length is between 2000 and 3500 words, plus essential tables or illustrations.

Tables and illustrations should be referred to in the text. Tables should be typed in double spacing on separate sheets. Figures should be professionally drawn, making due allowance for the appropriate reduction. Glossy black and white photographs should be submitted unmounted wherever possible. Titles and detailed explanations should be given in the legends which should be typed on a separate sheet.

References should be numbered consecutively in the order in which they are first mentioned in the text. At the end of the article the full list of references should give the names and initials of all authors (unless more than six, when only the first three should be given followed by *et al*.). The authors' names are followed by the title of the article, the title of the journal abbreviated according to the style of *Index Medicus*, year of publication, volume number and first and last page numbers. Titles of books should be followed by the place of publication, the publisher and the year, e.g.

> Soter NA, Wasserman SI, Austen KF. Cold urticaria: release into the circulation of histamine and eosinophil chemotactic factor of anaphylaxis during cold challenge. *N Engl J Med* 1976; **294**: 687-90
> Ostler AG. *Confidential: mechanisms and functions*. Englewood Cliffs: Prentice Hall, 1976

1 The Vancouver style. *J roy nav med Serv* 1975; **65**: 179
2 International Committee of Medical Journal Editors. Uniform requirements for manuscripts submitted to biomedical journals. *Br Med J* 1982; **284**: 1766-70

Notice to subscribers

The Journal of the Royal Naval Medical Service is published three times a year in March, July and November, one volume comprising three issues. The rates of subscription are as follows:

1 RN and RNR medical and dental personnel on the active or retired list, Consultants to the Royal Navy Medical Service and QARNNS personnel, other Service or civilian personnel — **£12.00 a year post free**
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All communications relating to subscriptions and notifications of changes of address etc should be forwarded to the **Editorial Secretary, Monckton House, Institute of Naval Medicine, Alverstoke, Hants PO12 2DL**.

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Editorial

Not for the first time in its history the JRNMS is experiencing considerable financial difficulties with a net loss of approximately £5000 over the past two years. The Editorial Board has approved various measures to try to remedy the situation including changing printers and actively seeking more advertising revenue. However the major cause of loss of income is the gradual but seemingly inexorable loss of subscribers. This loss appeared to be increased significantly by the last rise in the annual subscription from £8 to £12 which is why the Board is reluctant to increase the subscription further.

The RAMC operate a policy of automatically deducting the annual subscription for their Journal from the pay of all RAMC officers and this appears to be accepted without major objections. It is a sad fact that a considerable proportion of currently serving RN Medical Officers are not subscribers although most of them probably do get to see a copy of most issues. What is the feeling amongst current subscribers as to the best way to increase the circulation and therefore increase income? Any and all constructive suggestions will be gratefully received.

In the meantime would you all try and persuade your non-subscribing colleagues to change their minds and come to the rescue of the JRNMS. It is not supported by public funds, if it cannot be made to be self supporting it will have to cease publication.

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Climatic and environmental factors in the aetiology of decompression sickness in divers

J R Broome

(Based on the author's dissertation for the award of Membership of the Faculty of Occupational Medicine of the Royal College of Physicians)

Abstract

As decompression sickness (DCS) may occur unexpectedly after safe dives it was hypothesised that the weather and tidal factors could contribute to the risk.

One hundred and seventy seven cases of DCS were identified from the Institute of Naval Medicine's diving accident records and allocated to a 'safe' group or control 'risky' group depending on the dive profiles. Comparison of the prevailing environmental conditions between groups revealed significant differences in air temperature and windchill ($p = < 0.001$ for all dives) and for air minus water temperature ($p - < 0.01$ for all dives). The results imply that exposure to a cold thermal environment following diving, particularly when the air temperature is colder than the water temperature, may be a previously unrecognised risk factor for DCS.

INTRODUCTION

There are between 10 and 20 diving related deaths and between 200 and 300 cases of decompression sickness (DCS) reported in Britain each year[1] but while it is generally accepted that the symptoms and signs of DCS in divers result from the formation of inert gas bubbles within blood vessels and tissues, our understanding of the underlying aetiology remains incomplete.

During two years employment at the Institute of Naval Medicine (INM) the author noted that DCS cases often presented in clusters around weekends. This in itself was hardly surprising as most amateur recreational diving takes place at weekends. However clusters of cases grouped around some weekends and not around others, and this could not be explained by increased numbers of people diving over certain weekends, eg bank holidays. To explain the above observation it was hypothesised that external variables such as the prevailing weather or environmental conditions may have a bearing on the incidence of DCS in Britain.

Surgeon Commander Broome is currently on an exchange appointment in the USA.

AIM

The aim of this study was to investigate the relationship between environmental and climatic factors and the incidence of DCS in Britain.

HOW MIGHT THE WEATHER AND ENVIRONMENT INFLUENCE DCS?

Changes in barometric pressure

Changes in atmospheric pressure in the order of 30 millibars over a 24 hour period are not unknown. The author has observed (particularly in experimental saturation dives) that very small changes in chamber pressure can provoke or relieve the symptoms of DCS. Could low or falling atmospheric pressure in the hours following a dive contribute to the development of DCS?

Water temperature, air temperature and windchill

Water temperature, air temperature and wind

chill may influence the skin and subcutaneous tissue temperature of the diver before during and after a dive although this will also depend on the degree of insulation provided by clothing These temperature mediated effects on local tissue perfusion and the tissue solubility of inert gas could have a bearing on the risk of DCS

Wind speed

Wind speed influences sea state and wave height, often in conjunction with tide Wave height could effect not only the ability to assess depth accurately from a boat but also make accurate depth keeping increasingly difficult at shallower decompression stops Any inaccuracies in depth assessment could result in an increased likelihood of DCS

Tide

Tidal flow during the course of a dive will tend to increase the work necessary to perform underwater tasks as the diver must swim constantly just to stay in the same place The increased muscular exertion provokes increased cardiac output and peripheral blood flow Tissues with increased perfusion absorb more inert gas in a given time and thus diving in conditions where there is a strong tidal stream might be expected to increase the risk of DCS In Service diving, it is recommended practice to calculate the decompression for a deeper or longer dive than was actually performed if the dive involves hard physical exertion[2]

In addition to tidal flow change in depth of water due to tide could affect the incidence of DCS by reducing the accuracy of depth assessment

SUBJECTS AND METHOD

Case finding

The subject cases for the study were all the diving accident cases reported to and recorded by the Undersea Medicine Division of INM in the six years 1984 1989 Suitable cases of DCS for inclusion in the study were identified by scrutiny of the 831 handwritten diving accident records covering those years All cases diagnosed at the time as cerebral arterial gas embolism (CAGE) or pulmonary barotrauma were rejected and all cases with a dive history of emergency or panic ascent which could predispose to these diagnoses were also excluded Cases of non-diving related illness were excluded by reviewing follow up notes and by rejecting cases unresponsive to compression treatment

Extraction of details from diving accident records

The following details were sought from each DCS case record

1 Diagnosis (type of DCS)
2 Date and time of dive or dives
3 Location of dive
4 Depth of dive(s)
5 Duration of dive(s)
6 Decompression stops made (if any)
7 Time from end of dive to onset of symptoms
8 Location of diver at onset of symptoms
9 Age and sex of diver

The first five items listed above were considered essential to the study and cases where any of these details were missing were rejected Absence of any of items 6 to 9 although important were not considered so vital as to exclude the case from the study

Decompression requirement

To determine any inadequate or omitted decompression the dive profile for each case was compared with Royal Navy Air Decompression Table 11 as an arbitrary standard Where multiple dives took place on the same day the RN rules for combined dives were applied to the calculation As many case records contained only vague or absent details of any stops carried out on ascent the calculation was based on the basic diver profile alone ignoring any purported stops

The calculation of omitted decompression allowed the subject dives to be divided into two basic groups which formed the basis for the creation of a database

a **Index 'SAFE' group**
Those dives which appeared to conform with the schedules specified in RN Table 11 as no stop dives following which DCS would not have been expected to occur

b **Control 'RISKY' group**
Those dives which exceeded the 'safe' limits as defined by RN Table 11 and in which DCS was not wholly unexpected

Weather data

The Meterological Office at Bracknell holds archive weather data collated from recording centres throughout the British Isles. Knowing the date time and location of the dive resulting in each case of DCS the following weather data was ascertained

a Barometric pressure at leaving surface (millibars)
b Barometric pressure at onset of symptoms (millibars)
c Air temperature (°C)
d Wind speed (miles/hour)
e Sea surface temperature (to nearest °C)

For each case the following were then derived

f The difference between the barometric pressure at the start of the dive and the barometric pressure at the onset of symptoms
g The difference between the air and surface water temperatures
h Windchill index[3]

Where multiple dives took place the above data was determined only for the final dive

Tide data

Admiralty Tide Tables[4] for the years in question were obtained from the archives at the Hydrographic Office in Taunton and for each case the following details were determined

a Tidal range of the tide during which the dive took place
b The phase of the tide when the diver left surface (expressed as the number of hours from low water to indicate relative height of the tide irrespective of whether it was rising or falling)

Where multiple dives were performed the above data were determined for each dive

Data presentation

All the above data were entered onto microprocessor generated spreadsheets to allow manipulation into data groups such as single/multiple dives or dives with zero/greater than zero omitted decompression. Climatic data were analyzed for all dives (single and multiple combined) and then separately for single dives. Tidal data were analyzed for single dives only.

Statistical methods

Statistical comparison of the weather and environmental variates for the two groups was made by χ analysis of contingency tables. A p value of <0.05 was regarded as significant.

Within the contingency tables (Table 1 to 8) the percentage of all 'safe' or 'risky' cases in each range is given in brackets beside the number in each cell. The percentage of the total cases in each range contributed by the 'safe' values is given below each table to give an indication of trends.

RESULTS

One hundred and seventy seven cases of DCS were identified which satisfied the inclusion criteria. One hundred and sixteen cases occurred after single dives and 61 followed multiple dives.

Of the 61 multiple dives only six fulfilled criteria as 'safe' with the remaining 55 falling into the 'risky' category and because of these small numbers 'safe' and 'risky' multiple dives were not compared in isolation. When combined with the 36 'safe' and 80 'risky' single dives cases totalled 42 'safe' and 135 'risky'.

For the sake of brevity Tables 1 to 8 are restricted to those showing positive results or important negative results. A complete set of contingency tables, summary statistics and raw data may be found in the author's dissertation[5].

Description of results

Statistically significant differences were found between the prevailing environmental conditions at the time of the 'safe' dives resulting in DCS compared to the 'risky' dives. The difference was particularly marked for air temperature and windchill ($p=<0.001$ for all dives) and for air minus water temperature ($p=<0.01$ for all dives) with the suggestion of a 'dose response' effect. The difference in water temperature between the two groups failed to reach significance when the single dives only were examined but $p=<0.02$ for all dives. No 'safe' dives resulted in DCS if the air temperature was greater than 16.5°C whereas 28% of all 'risky' cases occurred above this temperature. Fifty percent of 'safe' cases occurred with the environmental air temperature below 13°C compared with 25% of 'risky' cases. Forty five percent of all 'safe' cases followed dives where the air temperature was at least 0.2°C *colder* than the surface water temperature. This compares with a figure of 25% for the 'risky' dives. Conversely only 22% of all 'safe' dives occurred if the air temperature was more than 1.6°C warmer than the water temperature compared to 50% of 'risky' dives.

A windchill index of less than 500 prevailed during only 15% of all 'safe' dives although 50% of 'risky' dives were performed under these conditions. Forty five percent of 'safe' dives were carried out when the windchill was greater than 612 compared to only 25% of 'risky' dives. No significant difference was shown between the groups for wind speed alone. For surface water temperature 33% of 'safe' cases followed dives in water at or below 11°C compared to 21%

Table 1 All Dives — Air temperature in °C

	<12·9°	13·16·2°	16·3·18·5°	>18·5°	All
Safe	21 (50%)	18 (43%)	3 (7%)	0 (0%)	42
Risky	34 (25%)	34 (25%)	33 (25%)	34 (25%)	135
Totals	55	52	36	34	177
Safe as % of total	38%	34%	8%	0%	24%

$\chi^2 = 25.05$ with 3df $p < 0.001$*

Table 2 All Dives — Windchill factor

	0·410	411·500	501·612	>612	All
Safe	4 (10%)	2 (5%)	17 (40%)	19 (45%)	42
Risky	34 (25%)	33 (25%)	34 (25%)	34 (25%)	135
Totals	38	35	51	53	177
Safe as % of total	11%	6%	33%	36%	24%

$\chi^2 = 16.38$ with 3df $p < 0.001$*

Table 3 All Dives — Air minus water temperature in °C

	−10 to −0·2	0·1 to +1·5	1·6 to 4·1	>4·1	All
Safe	19 (45%)	14 (33%)	7 (17%)	2 (5%)	42
Risky	34 (25%)	34 (25%)	33 (25%)	34 (25%)	135
Totals	53	48	40	36	177
Safe as % of total	36%	29%	17%	6%	24%

$\chi^2 = 12.51$ with 3df $0.01 > p > 0.001$*

Table 4 All Dives — surface water temperature in °C

	1·11°	12·14°	15·16°	17·18°	All
Safe	14 (33%)	19 (45%)	5 (12%)	4 (10%)	42
Risky	28 (21%)	41 (30%)	43 (32%)	23 (17%)	135
Totals	42	60	48	27	177
Safe as % of total	33%	32%	10%	15%	24%

$\chi^2 = 10.12$ 3df $0.02 > p > 0.01$*

Table 5 All Dives — Wind speed (mph)

	0·6	7·10	>10	All
Safe	15 (36%)	13 (31%)	14 (33%)	42
Risky	41 (36%)	55 (41%)	39 (29%)	135
Totals	56	68	53	177
Safe as % of total	27%	19%	26%	23%

$\chi^2 = 1.29$ with 2df $p > 0.5$

Table 6 All Dives — change in barometric pressure from leaving surface to symptom onset (millibars)

	−11 to −0 1	0	0 1 to 27	All
Safe	12 (29%)	17 (42%)	12 (29%)	41
Risky	51 (36%)	41 (30%)	43 (32%)	136
Totals	63	58	55	176
Safe as % of total	24%	25%	22%	23%

$\chi^2 = 2\ 74$ with 3df $p > 0\ 5$

Table 7 Single dives — Tidal range (metres)

	0 5 2 2	2 3 2 9	3 0 3 6	>3 7	All
Safe	10 (28%)	7 (19%)	6 (17%)	13 (36%)	36
Risky	19 (24%)	20 (25%)	21 (26%)	20 (25%)	80
Totals	29	27	27	33	116
Safe as % of total	34%	26%	22%	39%	31%

$\chi^2 - 2\ 55$ with 3df $p\ 0\ 5 > p > 0\ 1$

Table 8 Single dives — Tide Hours from low water

	0 1	1 5 3	3 5-4 5	5-6	All
'Safe	5 (14%)	11 (30%)	6 (17%)	14 (39%)	36
Risky	25 (31%)	21 (26%)	16 (20%)	18 (23%)	80
Totals	30	32	22	32	116
Safe as % of total	17%	34%	27%	44%	31%

$\chi^2 - 5\ 62$ with 3df $0\ 5 > p > 0\ 1$

of risky cases Only 22% of safe cases followed dives in water of 15°C or warmer compared to 49% of risky dives

No statistically significant difference was found between safe and risky dives with regard to barometric pressure.. difference between barometric pressure at the time of the dive and symptom onset wind speed alone or tidal factors No difference was found between the type of DCS suffered following safe or risky dives nor was age or gender shown to be a significant influence

DISCUSSION

Diving in cold water has long been said to increase the likelihood of DCS The novel finding that the thermal conditions of the surface nvironment before or even more importantly *after* a dive may be of as great or greater importance than the water temperature itself requires examination

The relationship between environmental temperature during immersion and predisposition of a diver to DCS is complex but a useful resumé of the main issues is given by Prendergast and Olszowka[5] The crucial determining factor is the way in which warming and cooling of a diver by the environment affects blood flow to skin adipose tissue and underlying skeletal muscle.. since the blood flow is an important determinant of inert gas exchange in these tissues

The effect of temperature during a dive may be considered in three distinct phases

Bottom phase

A diver who is warm at the start of the dive and

who remains warm during the bottom phase of the dive will maintain blood flow to peripheral tissues better than the diver who is cold with peripheral vasoconstriction during these periods

Although in both the above situations divers will absorb excess nitrogen into their tissues while they descend in the water and remain under pressure at the bottom, the cold diver will absorb less inert gas than the warm diver because of lower peripheral blood flow. This reduction in inert gas load may be partially offset by an increase in tissue nitrogen solubility as temperature falls[7] but this effect is likely to be small over the physiological range and its importance is controversial[8]. Evidence for the relatively greater inert gas load taken up by the warmer diver is provided by the observation that divers kept warm by hot-water fed diving suits experience more DCS[9].

The process by which excess inert gas is eliminated from the body of a diver can be divided into the in water decompression phase (including time swimming on the surface) and the surface phase of 'off gassing' which continues for some hours after leaving the water.

In water decompression phase

The in water decompression phase is the phase of maximum reduction in pressure. The diver who is warm during the dive and remains warm during the in water decompression phase will experience little change in the perfusion of peripheral tissues other than that promoted by exercise. If however the diver becomes cold and peripherally vasoconstricted during the in water decompression phase the rate at which excess inert gas can be eliminated is reduced and may become sufficiently slow to allow gas bubbles to form. These circumstances are common in UK waters which are relatively cool and even with good thermal protection most divers will begin to cool, at least peripherally, toward the end of a dive. Longer, deeper dives where compression stops are required are particularly likely to involve cold periods of inactivity at the end of the dive.

For the diver who has been cold and peripherally vasoconstricted throughout the dive being cold during the in water decompression phase is less of a problem as his excess gas load is smaller.

Surface 'off gassing' phase

On emerging from the water the diver still has a significant excess of inert gas dissolved in tissues. The results of this study suggest that unexpected DCS is unlikely to occur with surface air temperatures of over 18.5°C and that 'safe' dives are more likely to result in DCS if the surface environment is cold or as windchill increases. The risk also appears increased if the air temperature is colder than the surface water temperature. Such observations are readily explicable if the rationale behind the effects of thermal state during the dive are extended to the post-dive surface environment. It seems likely that continued or aggravated peripheral vasoconstriction in the post dive surface phase may delay inert gas elimination sufficiently to precipitate DCS.

The cooling from a damp neoprene wet suit exposed to windchill may be substantial and be expected to cause peripheral vasoconstriction and reduced blood flow to superficial tissues[8]. An impermeable dry suit with warm underclothing may give better thermal protection but during the course of the dive the underclothing will frequently have become damp around the wrist and neck seals reducing thermal insulation. Once out of the water the tendency of many divers to remove any hood worn during the dive thus exposing the head with wet hair is likely to increase any cooling effect.

The study found that 'safe' dives which result in DCS appear to be associated with a small or negative difference between air and surface water temperature. When this situation exists the sensation that it is warmer in the water than out is familiar to anyone who indulges in watersports around Britain's coasts. On leaving the water the resulting reflex peripheral vasoconstriction is independent of any marked fall in core temperature and depends on relative cooling of the skin[10]. This will tend to prolong or exacerbate vasoconstriction of the peripheries or initiate it if none pre exists due to cold exposure during the dive. The occurrence of vasoconstriction due to *relative* skin cooling may explain the observation that cases of DCS followed 'safe' dives during the warmer summer months in the UK as well as during cooler times of year.

An explanation for the finding that no unexpected cases of DCS occurred if the air temperature was greater than 18.5°C may be that provided the post dive environment was warm enough the diver was unlikely to experience peripheral vasoconstriction for long enough or of sufficient degree to impair inert gas elimination.

Other studies provide supporting evidence for

the role of peripheral peripheral cooling in the aetiology of DCS. Dunford and Hayward studied the effects of a warm bath versus simple insulation post dive in divers who were either relatively warm or relatively cold during the dive itself. They found that the cold dive group had Doppler bubble counts lower by a factor of three than the warmer dive group. The divers who were relatively warm during the dive but not actively rewarmed in a bath after a dive showed a significant increase in venous gas bubbles detected by Doppler ultrasound compared to the warm divers who had a warm bath after the dive.

Following decompression from a simulated saturation dive to 100 feet Mekjavic and Kakitsuba[8] reported increased Doppler bubble scores in three of four subjects kept cool for three hours in an environmental chamber at 10°C compared to the finding if the chamber temperature was 40°C. Interestingly they also report that following the cold air exposure the same three subjects with raised bubble scores reported mild joint pain symptoms of DCS after a hot shower. No symptoms resulted from hot showers after the 40°C exposure. Subject numbers were small but the authors postulate that in addition to the reduction in peripheral tissue perfusion due to cold exposure post-dive causing an increase in tissue tension of inert gas a decrease in the tissue solubility of inert gas due to the rapid rise in skin temperature caused by the hot shower may also have played a part in the development of symptoms.

This is the first published study to examine the epidemiological effects of climate and environmental factors on the incidence of DCS outside the confines of the laboratory or experimental diving facility. The number of cases in the study is relatively small but the following conclusions can be drawn:

1. A prevailing cold surface environmental temperature or a high windchill index is strongly linked to the development of DCS after dives that would normally be regarded as safe.
2. Experimental evidence from other authors is consistent with this study's results and the study findings are biologically plausible. The likely mechanism for the observed increased risk of DCS is related to the thermally induced changes in perfusion of peripheral tissues and the influence these changes have on the rate of inert gas elimination.
3. Practical advice to divers would be to keep as warm as possible following a dive. If this is not possible be conservative in interpreting decompression schedules when the air temperature is cold or if there is high windchill. Particular care should be taken if the surface air temperature is colder than the water temperature.

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J roy nav med Serv 1993 79 75 79

Paediatric resuscitation in adverse circumstances: A comparison of three routes of systemic access

S Q M Tighe, S V Rudland, P M Kemp and C R Kershaw

Summary

Nine Kurdish children were admitted to a British Surgical Support Team facility in Northern Iraq requiring resuscitation for dehydration estimated to be of 10% loss of body weight. Systemic access was by intravenous (IV 6 patients) intraosseous (IO 6 patients) and/or intraperitoneal cannulation (IP 4 patients) and resuscitation was according to a defined protocol. Insertion times, maximum initial flow rates and complications were assessed. The mean insertion times were 78, 112 and 26 seconds and the mean maximum initial flow rates of crystalloid were 240, 60 and 400 ml/hour for IV, IO and IP routes respectively. One IV lasted more than 24 hours and three failed. One IO cannula blocked and one IP was removed because of saline extravasation. IO bolus injections were painful. Total volumes infused and time to adequate hydration varied widely and there were no complications. The mortality was 33% compared with 11% for 18 less severely dehydrated children. It is concluded that the IP and IO routes allow severely dehydrated children to be resuscitated without significant complications when IV access is difficult to establish.

INTRODUCTION

In severe dehydration of any aetiology rapid systemic fluid resuscitation is the key to successful management. Intravenous (IV) administration is the ideal but access is often difficult and/or time consuming due to the inevitable circulatory collapse[1]. For children the intraosseous (IO) route is an alternative, allowing rapid reliable access to the systemic circulation without significant associated morbidity[2]. Intraperitoneal (IP) administration has been recommended for the same purpose[3].

This paper compares the above three routes of administration for the resuscitation of Kurdish refugee children in a field hospital. The children suffered from severe dehydration associated with chronic diarrhoea, protein calorie malnutrition and circulatory shock. A protocol for fluid administration is also presented.

PATIENTS AND METHODS

Systemic fluid was administered to nine children admitted to the Royal Marine field hospital at Sirsenk, Northern Iraq, who were estimated to have lost more than 10% of their body weight due to dehydration. 10% dehydration was defined as follows:

1. Flaccidity and drowsiness.
2. Systolic blood pressure less than 60 mm Hg or finger nail bed capillary return greater than 5 seconds.
3. Poor tissue turgor, no tears, sunken eyes.

The receiving medical officer attempted percutaneous IV access using a 23G Butterfly needle (Venisystems™ Abbot Ireland Ltd). If this failed or if another route of access was considered desirable a second operator inserted a 14G IO trocar (Cook Medical USA) or an IP 21G Butterfly needle or both. The site of venous access was at the operator's discretion. IO trocars were inserted into the upper tibia after local anaesthetic infiltration according to the manufacturer's instructions (*Figure 1*). IP

Surgeon Commander Tighe is a Consultant Anaesthetist at RNH Plymouth. Surgeon Lieutenant Commander Rudland has now left the Navy on the Emergency List and is in General Practice in Devon. Surgeon Lieutenant Commander Kemp is Lecturer in Nuclear Medicine in RNH Haslar. Surgeon Commander Kershaw is a Consultant Paediatrician at RNH Haslar.

Fig. 1 Anatomical sites for intraosseous infusion

needles were inserted into the linea alba midway between the symphysis pubis and the umbilicus and attached to a reservoir of warmed Ringer's lactate solution with the flow control off. The needle was then advanced with the flow control on halfway until a loss of resistance was felt as the needle entered the peritoneal cavity and free fluid flow was observed.

The time from the completion of equipment and skin preparations to the start of the infusion was noted.

Resuscitation was initiated with boluses of Ringer's lactate solution and a continuous infusion of 5% Dextrose in 0.18% saline according to a strict protocol (*Figure 2*). Unicef Oral replacement solution (ORS) was also encouraged at a maximum rate of 150 mls/kg/24 hours.

Patients were clinically reassessed at hourly intervals until a state of adequate hydration was reached as defined by the protocol. The time taken to achieve this state was noted.

The infusion fluid reservoir was placed one metre above the patient. The maximum initial flow rates and duration of infusion were noted for each route of access together with any associated complications.

Flucloxacillin at a recommended dose of 12.5 mg/kg was administered 6 hourly through IO trocars to cover the theoretical risk of osteomyelitis.

The mortality was compared with that of children less than 10% dehydrated admitted during the same period and treated with oral and/or nasogastric fluids.

RESULTS

Nine children were admitted with dehydration greater than 10%. *Table 1* details the ages, weights, percentage of ideal weight for age[5] and diagnoses. All the children were severely malnourished and dehydrated because of diarrhoea.

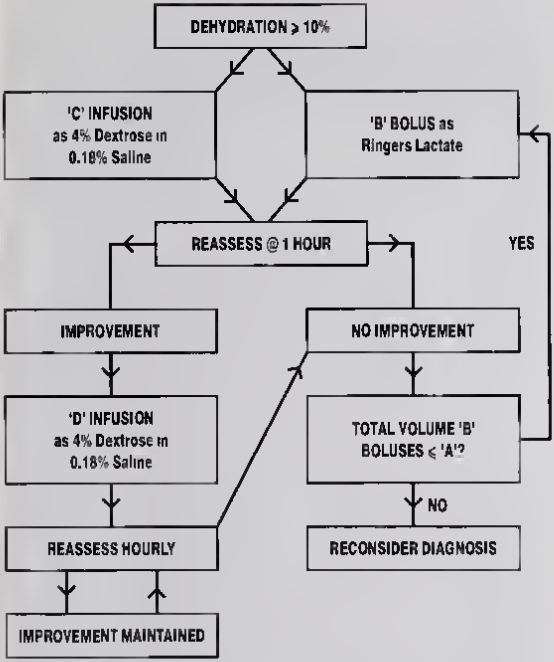
Table 2 details the routes of access used and the insertion times. In three of the nine children IV cannulation was not attempted. All IO and IP insertions were successful. The IP technique was the quickest (15-60, mean 26 seconds), the IO the slowest (20-240, mean 112 seconds) whilst IV was in-between the two (30-120, mean 78 seconds).

Table 3 indicates the maximum flow rates achieved. The mean flow rate for IV was 77.2 drops/minute (240 mls/hour) for IO 22.2 drops/minute (60 ml/hour) and for IP 133.3 drops/minute (400 mls/hour).

Three IV's ceased at 4, 16 and 18 hours. One of the IO trocars blocked at 16 hours and was removed. One of the IP needles was removed after 16 hours because of saline leakage and an associated pyrexia. All IO boluses were painful particularly with antibiotics. There were no insertion site infections. Patient 3 had severe generalised subcutaneous oedema caused by saline extravasation from an IP needle placed by the referring physician. She was hypothermic, severely shocked and hypovolaemic. IO access allowed intravascular rehydration. Similarly in patient 9, a case of cholera, a venous cut down and internal jugular line had been pulled out by the patient before he had a second hypovolaemic collapse in the early hours. The IO trocar allowed sufficient resuscitation to facilitate percutaneous venous access.

The overall mortality of 33% is compared with a rate of 11% for 18 less severely dehydrated children admitted during the same period.

Total volumes infused and time to adequate hydration varied widely according to the clinical state of the patient and did not correlate with outcome or with the route of access.



A mls – % Dehydration × Weight (Kgs) × 2·3 × 10
B mls – 20 × Weight (Kgs) for first bolus 10 × Weight (Kgs) subsequently
C mls Hr – 4 × Weight (Kgs)
D mls Hr – $\left[\frac{\text{A – (Total volume of 6 boluses)}}{\text{24 – Time elapsed (Hours)}}\right]$ + C

IMPROVEMENT CRITERIA
2 of the following
1 Urine Output > 1ml Kg Hr Age > 12 12
2ml Kg Hr Age < 12 12
2 ↓ Pulse ↑ Blood Pressure and ↓ Capillary Refill Time
3 Improvement in Tissue Turgor

Fig 2 Paediatric infusion protocol for the treatment of severe dehydration (>10%)

Table 1 Age weight % ideal weight for age and diagnoses

	Patient age (months)	Weight (kg)	% Ideal weight for age	Diagnosis
1	12	4 3	43	Enteritis candidiasis rickets
2	10	5 5	60	Enteritis candidiasis rickets
3	9	6 3	71	Gastro enteritis hypothermia Iatrogenic oedema
4	34	6 0	42	Enteritis candidiasis septic shock
5	18	6 0	52	Gastro enteritis hypothermia
6	5	3 6	51	Enteritis candidiasis chronic spasticity
7	1	2 4	57	Enteritis candidiasis
8	3	3 5	61	Enteritis candidiasis rickets
9	132	1 8	60	Cholera

Table 2 Routes of access used and insertion times (secs)

Patient	Intra venous	Intra osseous	Intra peritoneal
1	30	80	NA
2	NA	30	15
3	NA	20	NA
4	60	240	NA
5	60	180	NA
6	120	NA	15
7	120	NA	NA
8	NA	NA	15
9	*	120	60

* IV cut down performed
NA Not attempted

Table 3 Maximum flow rates achieved in drops per minute (20 drops equals one ml)

Patient	Intra venous	Intra osseous	Intra peritoneal
1	76	12	–
2	–	57	120
3	–	12	–
4	70	20	–
5	90	10	–
6	80	–	130
7	70	–	–
8	–	–	150
9	–	200	–

DISCUSSION

The IP technique was associated with the most rapid insertion times and the best flow rates. This route has been advocated for maintenance therapy of cholera diarrhoea[4] but is not recommended for initial rehydration as decreased mesenteric blood flow is thought to impair absorption from the peritoneal cavity[5,7] Unlike the IV and IO methods the IP route is only providing indirect access to the intravascular compartment The extensive subcutaneous oedema seen in a child referred from another centre demonstrates the dangerous consequences of not locating the needle tip in the peritoneal cavity This complication can be avoided by scrupulous attention to insertion technique In our hands the IP technique proved to be a safe simple and rapid means of providing an initial fluid load

The IO route has been recommended for acute paediatric resuscitation[1-3] Similar plasma drug concentrations can be achieved with IV and IO routes[8,9] and fluid injected into the medullary space rapidly diffuses into the systemic circulation[10] The authors had little difficulty in mastering the unfamiliar IO procedure Even though IO insertion was relatively slow all sitings were successful and appeared to be painless after local anaesthetic infiltration although subsequent bolus administration of fluid and drugs was uncomfortable The mean insertion time of 112 seconds is very similar to previous observations[1] The distal rather than proximal tibial site is recommended for those over five years but we successfully sited a cannula in the proximal tibia of an eleven year old patient and achieved excellent flow rates with gravity alone The ease with which this particular cannula was sited may have reflected the patient's nutritional status and degree of bone mineralisation Antibiotics were administered because of the theoretical risk of osteomyelitis

and no obvious infections were seen The slow flow rates achieved with the IO cannulae are similar to those described by some authors[11] although Arbeiter and Greengard[1] achieved a mean rate of 138 mls per hour by gravity alone In infants it has been suggested that the cannula should be inserted more proximally at the level of the tibial tuberosity where the medullary cavity is larger so that higher flow rates can be achieved No cannulae became displaced and reliable means of access to the systemic circulation was preserved proving to be life saving in one case However blockage can occur and regular flushing is required

IV infusion remains the method of choice when the patient s condition and available skill allows but it can be technically difficult to secure venous access in very small shocked infants In this study IV cannulation was not attempted and therefore can be considered to have failed on three occasions because of multiple venepuncture attempts by the referring physician or extreme peripheral vasoconstriction In comparison IO and IP insertions were always successful and are a useful means of expanding the intravascular compartment to facilitate later IV access Half the IV cannulae lasted within 18 hours of insertion and whilst access would undoubtedly have been prolonged by the use of a catheter instead of a needle IO and IP routes were more reliable

The infusion protocol (*Figure 2*) was constructed in the field from the Paediatric Vade Mecum[12] erring on the side of caution to prevent fluid overload and electrolyte imbalance. It was not possible to assess serum electrolytes and as diarrhoea was the inevitable aetiology dehydration was considered to be isotonic It is possible that hypertonic dehydration may have been more frequent than realised due to excessive fluid rather than electrolyte loss in the diarrhoea or the previous use of electrolyte rich oral rehydration fluids in a hot dry climate The protocol has not been objectively studied and requires more thorough assessment before it can be recommended without reservation

The mortality of 33% is compared with a rate of 11% in far less severely dehydrated and malnourished children These high mortality rates probably reflect the associated pathology rather than the dehydration itself

The difficulties with refined numbers in this study and the field situation precluded the use of adequate controls proper randomisation and statistical analysis Our observations must be regarded in this context

In conclusion the IP and IO routes allowed severely dehydrated children to be reliably rehydrated without significant complications These procedures required less skill and were more frequently successful than peripheral IV cannulation When experienced venepuncturists are unavailable or IV access is difficult to establish one or a combination of these alternative techniques may be life saving

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Case report: Polymorphous haemangioendothelioma, a rare cause of persistent lymphadenopathy

R A Ross, P R Monteith and J G McAdam

INTRODUCTION

We report a case of a rare tumour arising in axillary lymph nodes and presenting as persistent lymphadenopathy. The tumour belongs to a group of primary vascular tumours of lymph nodes and has been called polymorphous haemangioendothelioma[1]. Only two other cases have been reported in the literature. The behaviour of this rare tumour is uncertain and optimal therapy has yet to be determined.

CASE REPORT

A fit 31 year old man was referred in July 1990 with a history of pain in the right axilla following a minor sports injury.

On examination he had a palpable lymph node measuring 2 cm by 2 cm in the medial wall of the right axilla. There was no history or evidence of infection within the area drained by the axillary lymph nodes but clinically it was felt the lymphadenopathy was reactive.

Review three months later revealed persistent lymphadenopathy which was now hard, irregular and clinically suspicious of malignancy. His erythrocyte sedimentation rate was 4 mm/hr and both a full blood count and chest X ray were normal. He was referred for excision biopsy.

At operation a mass of hard lymph nodes was removed. Histological examination showed a vascular tumour with a lobular pattern (*Figure 1*). The tumour cells were arranged mainly in solid clumps with some cells lining vascular spaces. Only mild nuclear polymorphism was present with a low mitotic rate (2·3 mitoses per 100 high power fields). There was no convincing lymph node structure and the tumour was initially described as an unclassifiable vascular tumour of uncertain malignant potential, the appearances being reminiscent of an haemangioendothelioma. The lobular pattern made angiosarcoma unlikely.

A computerised tomography scan of head, neck and thorax a month later demonstrated a residual mass in the right axilla. Wide excision of the subcutaneous tissue and lymph nodes from the right axilla was then performed. Histologically this tissue was similar to that obtained previously except for evidence of residual lymph node architecture. Further management was delayed pending a definitive histological diagnosis.

At review in April 1991 he remained clinically disease free but he presented again in August 1991 with a further swelling in the right axilla and was admitted for an axillary clearance. At operation there was further local recurrence with large lymph nodes surrounded by highly vascular connective tissue. The axilla was completely cleared of lymph nodes and histology showed that all were involved by tumour. A repeat CT scan of thorax and abdomen showed no other areas of lymphadenopathy.

Currently two years from presentation the patient is well and remains under review.

Surgeon Lieutenant Commander Ross is a surgical specialist at RNH Plymouth. Surgeon Lieutenant Commander Monteith has recently left the Royal Navy after a Short Career Commission and is now on the Emergency List. Major McAdam is a surgeon with the RAMC.

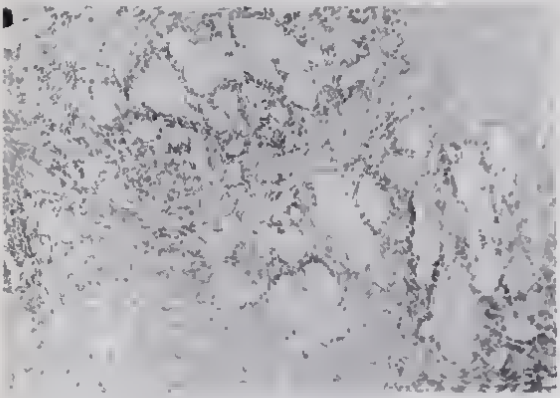

Fig. 1 Photomicrograph showing a mixture of angiomatous and solid areas with no residual lymph node structure.

DISCUSSION

The striking feature of this case is the rarity of the tumour which has proved extremely difficult to diagnose. The term polymorphous haemangioendothelioma has been suggested by Chan and co workers to emphasise the variable histological patterns seen in different parts of the same tumour. These appearances help to distinguish this tumour from spindle cell haemangioendothelioma and epithelioid haemangioendothelioma.[4] This previously uncharacterised tumour is described as a borderline malignant vascular tumour exhibiting solid primitive vascular and angiomatous patterns with relatively bland cytological features. Two other cases of polymorphous haemangioendothelioma have been reported by Chan *et al*.

Because of the extreme rarity of this previously unrecognised condition there is very little clinical experience of its management. In particular the behaviour of the tumour is uncertain and it is not yet clear whether the tumour can occur at extranodal sites or whether it can metastasise. The case reported suggests there is a high risk of local recurrence and that consideration should be given to early lymph node clearance in the affected field. A policy of surveillance has been adopted in view of the uncertain benefit of adjuvant radiotherapy in this condition.

Clinicians should be aware of this rare condition which has a potential for local recurrence if initial surgery is insufficiently radical.

ACKNOWLEDGEMENTS

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A clinicopathological survey of gallstones in the autopsy population

R Heames and Clair du Boulay

Abstract

This prospective study looked at the autopsy prevalence of gallstones and their relationship with symptoms and gallbladder pathology

Fifty consecutive autopsies were selected The gallbladder was examined macroscopically and microscopically and gallstones were examined cut and classified

Four females at autopsy had had previous cholecystectomies Thirty three percent of patients had gallstones at post mortem with a male to female ratio of 1 1 24 Histological features of the gallbladders were normal 39 1% cholecystitis 37 0% hypertrophy 8 7% and fibrosis 15 2% Increasing age was significantly associated with increasing common bile duct (CBD) circumference

Muscle hypertrophy and fibrosis may represent part of a spectrum of barrel out gallbladder disease Fifteen percent of autopsy patients had calculi cholecystitis but were asymptomatic and the reason for this is unclear

INTRODUCTION

Cholelithiasis is one of the most common alimentary tract diseases with an estimated 20 million people having gallstones in the USA alone[1] The prevalence of gallstones has risen significantly in the last century giving rise to the concept that gallstones are a disease of civilisation The crude overall prevalence of gallstones at autopsy ranges from 1 5 44% [2] or 17 59 6% for women and 6 9 41 5% for men[3] Most screening studies show a positive relationship between the prevalence of gallstones and age[3] Gallstones are rare in children but do exist[4] and after the age of 40 the rise in prevalence is steady Cholelithiasis is significantly more common in women than men in all age groups[5] The female to male ratio is approximately ? 3 1[6] but over the age of sixty years_ this ratio approaches 1 1[6]

Cholesterol is the major component of gallstones in communities which have adopted a Western diet and culture[7] The amount of cholesterol in a stone varies from 11% 98%[8] decreases with age and higher amounts are more common in women[1] Pigment gallstones account for 11 33% of all gallstones[9] and are more common in men[1] Seventy eight to ninety percent of calculi are of mixed variety[1,9] Cholesterol and pigment stones represent two different conditions with different pathogenesis and probably different risk factors[1]

The vast majority of gallstones are asymptomatic and this increases with age Gallstones present as biliary pain in 5 22% of gallstone subjects or less often as acute cholecystitis biliary obstruction or pancreatitis[4] In a study comparing 285 people with gallstones and 1044 people without the frequency distribution of epigastric and/or substernal burning upper or lower abdominal pain intolerance to fatty food nausea and/or vomiting and jaundice was similar for the two groups[10]

The natural history of silent gallstones shows that 50 70% of patients remain free of complaints and symptoms during life[11] If stones do become symptomatic it is sooner rather than later[10] In contrast patients with mildly symptomatic stones are at risk for future pain and complications Gallstones may give rise to non specific symptoms and it is difficult to define any abdominal symptom or combination of

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symptoms to distinguish symptomatic and asymptomatic stones[8]

Acute inflammation of the gallbladder is associated with stones in the majority of cases a single stone frequently obstructing the cystic duct The inflamed gallbladder is distended tense and discoloured There is oedematous thickening of the wall and congestion of overlying serosal vessels[9] Chronic cholecystitis is almost exclusively accompanied by gallstones The chronic inflammation may be the aftermath of one or more attacks of acute cholecystitis but is more often insidious Multiple small stones are usually present which cause mechanical injury The gallbladder becomes pale contracted and thick walled with a pearly white appearance[9] Biliary sludge is a collection of mucus calcium bilirubinate and cholesterol crystals that is usually recognised by characteristic echoes on ultrasonography Its pathogenesis clinical significance and ultimate prognosis remain uncertain Prevalence of subjects with sludge is low and one study showed that 5 7% of patients at post mortem had granular biliary sludge[10] Of patients with biliary sludge 8 3% develop asymptomatic gallstones and 6 3% of patients have severe biliary pain attacks[11]

The aim of this study was to undertake a prospective survey of autopsies to assess the prevalence of gallstones and their relationship with symptoms and gallbladder pathology

MATERIALS AND METHODS

Fifty consecutive autopsy gallbladders were examined at Southampton University Hospital Unit with access to the full set of hospital case notes Macroscopic features of the gallbladder were noted along with any relevant symptomatic history from the clinical case notes The gallbladder and extrahepatic biliary tree were opened the bile was inspected and the circumferrence of the common bile duct (C&D) was measured at its widest part Any gallstones collected were classified into the following categories

a *Predominantly cholesterol*
b *Predominantly pigment*
c *Mixed*

A longitudinal strip of gallbladder from the fundus to the neck was resected and the strip included any areas of visual peculiarity The strips of gallbladder were processed in the standard manner and examined microscopically after staining with haematoxylin and eosin and haematoxylin Van Giesen

RESULTS

There were 27 males and 23 females in the study giving a male to female ratio of 1 17 1 Four of the females had had previous cholecystectomies for gallstones and were subsequently excluded from the results as the histology could not be traced The mean age in the study was 74 3 years and the majority of the cases (90%) were greater than 60 years of age (*Figure 1*)

Thirty three percent of the 46 autopsy patients had gallstones These were present in 29 6% of the males and 36 8% of the females giving a male to female ratio of 1 1 24 Gallstones were not significantly associated with increasing age ($p > 0.40$) although all gallstones occurred between the ages of 60 and 89

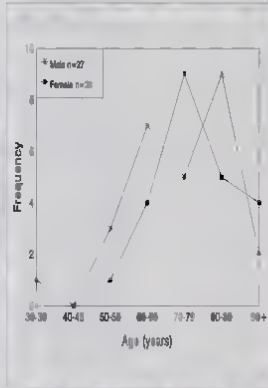

Figure 1 Age Distribution between Males and Females

All gallstones present were classified (*Figure 2*)

Twenty eight percent of the autopsy patients had had symptoms There were significant differences between sex and the presence of symptoms ($p = 0.02$) 14 8% of the males and 43 5% of the females had symptoms The types and frequencies of the symptoms were noted

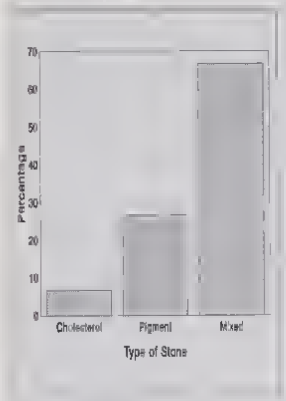

Figure 2 Classification of Gallstones

Table 1 Frequencies and Types of Symptoms

Symptom Type	Percentage
Epigastric/substernal burning	12 2%
Upper abdominal pain	14 3%
Lower abdominal pain	14 3%
Intolerance to fatty food	2 0%
Nausea +/ vomiting	10 2%
Jaundice	6 1%
Other	4 1%

Table 2 Macroscopic and Microscopic Features

Features	Percentage
Normal	36%
Inflammation only	17%
Hypertrophic only	4%
Fibrotic only	11%
Gallstones only	4%
Gallstones and inflammation	15%
Gallstones and hypertrophy	2%
Gallstones and fibrosis	6%
Gallstones inflammation and symptoms	4%

(*Table 1*). Overall 33 3% of the autopsy patients with gallstones had symptoms Conversely 16 1% of patients had symptoms but no stones

The following histological features were documented 39 1% were normal 37% had inflammation present in the wall 8 7% contained smooth muscle hypertrophy and fibrosis was found in 15 2% of gallbladders 11% of histologically normal gallbladders contained stones whereas the figure was 53% for inflamed gallbladders Listed is a table summarising all the features (*Table 2*)

The external appearance of the gallbladder was abnormal in 10 9% of cases and all of these contained biliary sludge when opened

The common bile duct (CBD) circumference showed a normal distribution of measurements with a mean of 16 5 mm The CBD circumference tended to be low when gallstones were present Increasing age was significantly associated with increasing CBD circumference ($p=0\ 04$)

DISCUSSION

Previous autopsy studies which looked at the prevalence of gallstones and their relationship to gallbladder pathology have not included gallbladder histology There were almost equal numbers of males and females in the autopsy study but four of these females arrived at post mortem having previously had a cholecystectomy This confirms the well known fact that more women have their gallbladders removed than men This study focuses mainly on the elderly age group — 90% of subjects were over 60 years of age

Thirty three percent of the autopsy patients were found to have gallstones and this was in accordance with other similar studies although at the upper end of the range [4] Gallstones were more commonly found in women with a male to female ratio of 1 1 24 This is in agreement with the literature which states that over the age of sixty years the male to female ratio approaches 1 1[5]

The majority of stones (66 7%) were of mixed type and this figure was lower than that which Armand *et al* showed (78%) Interestingly the number of pigment stones was much higher than expected although Trotman and Soloway[1] showed that pigment stones were more common in people aged with a peak incidence in the 70 79 year age group The number of

predominantly cholesterol gallstones was very low and thus was again similar to Arnaud *et al* [11] who discovered no pure cholesterol stones in their study. There was no significant difference between stone type and the sex of patients and this finding does not support the theory that gallstone disease in women is predominantly due to cholesterol stones.

Of the 28% of autopsy patients who had documented symptoms 26% could have had their symptoms explained by other pathologies present for example duodenal peptic ulcer pancreatitis small bowel infarct. Therefore realistically probably 98% of the autopsy patients were asymptomatic as defined earlier. This figure was marginally higher than that shown by other studies [1] and emphasises the fact that it is often difficult to distinguish symptomatic gallstone disease.

The prevalence of biliary sludge was 10.9% and this was considerably higher than that found by Vitetta *et al* [9] (5.7%). Interestingly biliary sludge was significantly associated with an abnormal macroscopic external appearance of the gallbladder. In these cases the abnormalities were usually a shrunken fibrotic gallbladder which was adherent to the liver. This indicates a possible relationship between biliary sludge and gallbladder pathology and should be looked at in more detail.

There was a tendency for the common bile duct (CBD) circumference to be at the lower end of the range when gallstones were present. This finding is in contrast to that which would have been expected and cannot be explained. CBD circumference is in direct proportion to CBD diameter therefore this study has shown a statistically significant increase in CBD diameter with age which is in accordance with the literature. Hunt and Scott[10] have shown that the bile duct increases in diameter with age by approximately 1 mm every 10-20 years and this may be a result of increased biliary stasis with ageing [3].

At histological examination 37% of gallbladders were found to be inflamed. This includes acute chronic and acute on chronic cholecystitis. 53% of these contained gallstones. This number may have been low due to the spontaneous disappearance of gallstones but Jensen and Jørgensen [4] have shown that disappearance only occurs in 4.5%. The majority of inflamed gallbladders showed chronic cholecystitis as cases of acute cholecystitis were more likely to have undergone previous cholecystectomy. This study shows that there was a 17% prevalence of chronic acalcular cholecystitis at autopsy and the significance of this is unclear.

Two important histological features identified were muscle hypertrophy and fibrosis. These were seen in a small but significant percentage of gallbladders and may represent part of a spectrum of burnt-out gallbladder disease. The number of gallbladders with hypertrophy and fibrosis were similar whether gallstones were present or not. This may lead to speculation that they are separate and distinct pathologies — perhaps a natural part of ageing.

A small number of autopsy patients had gallstones and no inflammation. Why this should be is not known but raises the question as to why some gallstones cause inflammation (58% in this study) and others apparently do not. Four percent of autopsies had gallstones inflammation and symptoms likely to be attributable to stones. The reason why these patients did not have cholecystectomies may be because their symptoms were due to another pathology for example irritable bowel syndrome they tolerated their symptoms or perhaps due to age and other illness surgery was too risky.

There is still the question of why 15% of autopsy patients had gallstones and inflammation but no symptoms. The relationship between inflammation and symptoms seems variable and unexplained. Although not always the case by definition all patients undergoing cholecystectomy are symptomatic but not all of these have biliary colic. Therefore some of these patients must have symptoms related to the gallbladder inflammation. If this is the case why do the majority of autopsy patients with calcular cholecystitis not have symptoms and what is the triggering factor for inflammation that causes symptomatic cholecystitis?

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Student Elective USA, November 1992-January 1993

A R Gibson

INTRODUCTION

During the fourth and fifth years of the medical course at King s College Hospital London students are allowed to undertake a two month period of elective study when the medical school gives the students an almost completely free rein to do whatever they wish This freedom presents many problems for the students as it is one of the few times any initiative is encouraged during the entire course There is a dilemma in deciding where to go and what to do and a major problem in arranging the necessary finance Within the medical school there is some degree of peer pressure depending on the peer group to go for the most exotic foreign holiday possible or to a renowned research establishment with the chance of a publication However most students opt for something in between a period of clinical experience and a period of leisure returning ready to face the long slog to finals exam in June

One of the most enjoyable rotations at King s is the Accident and Emergency attachment It is only here that medical students have a valuable role in the clinical management of patients Students are taught the practical skills of suturing and plastering and use these skills to ease the workload of the busy casualty officers I had recently joined the Royal Navy and it was this and my enjoyment of the Accident and Emergency attachment that strongly influenced my choice of elective MedSTAR (Medical Shock Trauma Advanced Resuscitation) a trauma centre at the Washington Hospital Center in Washington DC USA

Surgeon Sub Lieutenant Gibson is a medical student

MedSTAR

MedSTAR is designated a Level I Trauma Centre by the American College of Surgeons Three trauma teams provide every third day coverage with 24 hour multi disciplinary expertise in all phases of critical care Each team comprises two attending fellows (the equivalent of British consultants) a trauma fellow senior surgical residents and additional house staff including medical students One team is provided by the Washington Hospital Centre one by the United States Army and the other by the United States Navy MedSTAR has a broad referral base which serves nearly four million people in the Mid Atlantic region Two helicopters are used to transport patients to the unit from outlying districts and ambulances are used for patients around Washington itself

There is a fantastic quality of opportunity for a medical student On joining the team I was immediately impressed by the friendliness of the other team members and their eagerness to allow me responsibility in all phases of the management of the patients Students are involved from the initial treatment in the trauma bay the ward management the discharge and the out patient follow up Students are also encouraged to attend events in the weekly programme of the unit The weekly x ray conference was usually informative and interesting x rays taken the previous week would be used as a focus for a discussion on the management of trauma patients to which students were expected to contribute The morbidity and mortality conferences otherwise known as death and doughnuts as large sickly sweet doughnuts were served with the coffee were

also educational The senior residents would present patients discuss literature relative to the case and then undergo a searching grilling from the attending surgeons

The first week was quite tough a new country, a new medical environment where the protocols and procedures were subtly but significantly different from the United Kingdom Once a basic understanding of how the system worked was gained then there was a great opportunity to learn the principles of trauma management probably the best outside of a war zone although at times it seemed as if there was indeed a war going on Nothing could have prepared me for my first night on call It was quiet until late evening then the admissions were non-stop until 6 am These included two gunshot wounds one to the abdomen and one to the leg three victims of road traffic accidents two of whom were seriously injured two brutal assaults which between them required 60 70 stitches another assault and finally a cocaine dealer who had been almost scalped by a machete Throughout this onslaught the trusted procedures of emergency care were adhered to and all patients received a thorough work up A senior resident performed the primary and secondary survey, and the appropriate management was undertaken The calm professionalism and unflappability of all the staff from the nurses to the senior surgeons was most impressive At breakfast after the last patient had been dealt with the senior resident Jan Hamilton commented that it had been a fairly typical night at MedSTAR

As the month progressed and the trauma and was less busy I was taught some of the practical procedures involved in trauma management These included internal blood sampling via femoral and radial sites establishing intravenous access placement of nasogastric tubes insertion of Foley catheters positioning of chest tubes diagnostic peritoneal lavage and insertion of intra-cranial pressure monitors as well as plentiful opportunities to practise suturing

Every day we undertook two full ward rounds in which the students were expected to play a full part I would collate the results of tests performed on our patients and review their progress and then present them on the ward rounds The importance of developing a systematic way of doing this soon became apparent

The month was exceptionally hard work Every day involved clinical work Non call days would start around 6 15 am when I would check on the patients to gain the necessary information to present on the 7 am ward round More often than not on call days would mean 24 hours awake with 12 midnight to 6 am the period when the workload was heaviest By the end of the month I had had intense exposure to acutely ill patients developed a greater knowledge and confidence in how to manage these patients and importantly for finals confidence in presenting patients

SURGICAL INTENSIVE CARE

Following the attachment to MedSTAR I spent a week attached to one of the several surgical intensive care units at the hospital After the excitement and immediacy of the MedSTAR unit it was difficult to be so committed to this attachment but several things became apparent during the week The equipment used in the unit was the latest in high technology and extremely costly The nurses in the unit were highly motivated and trained to a high standard Listening to several attending surgeons and intensivists discuss post-operative care it was clear that much was still unknown about how the body adapts physiologically to major illness and injury

FLYING PRESENTATION PREVENTION AND SKIING

While with the unit I was able to spend a day on call with the paramedics this meant that I rode in the helicopters It was interesting to see the calm cool efficiency of these people at the scene and I was afforded an excellent view of Washington from the air Like many bodies of nursing they have a somewhat ambivalent attitude towards medical students and I was the first student to be allowed to do this

I also attended a day long seminar organised by the Department of Medicine which was designed to improve the presentation skills of the medical residents A slick and professional communications consultant was employed and he ensured that it was a beneficial experience A similar programme using a video recorder would be a very useful adjunct to the King s curriculum and help to provide confidence in our presentations

MedSTAR is also involved with the prevention of the violence with which it often has to deal The Washington Community Violence Prevention Programme is run from the hospital Members of the programme include a former cocaine dealer who had his life saved by Dr Howard Champion the British Director of MedSTAR The programme goes out into the

local schools and tried to educate the children in the dangers of crime drugs and violence I spent a day with the unit spending the afternoon at a nearby school It was a strange feeling being the only white person in a classroom listening to eleven year-olds telling me about the perils of cocaine The programme is an excellent idea and has received widespread support in the community and there is evidence that it is successful It is however an uphill fight in a neighbourhood where many are struggling financially drugs are widely available and gunfire is regularly heard on the streets

After Washington I went to Vail Colorado where I spent a short period of time with the Ski Patrol The Ski Patrol is responsible for the evacuation of injured skiers from the slopes and on a busy day the team will deal with up to 50 emergencies If there is the slightest doubt over the nature of the injury the Ski Patrol will transport the patient from the mountain in large red toboggan The ski patrollers are some of the best skiers on the mountain It was an education watching them deal with a first aid situation and being able to ski with them

CONCLUSION

MedSTAR at Washington Hospital Center is an excellent place to spend an elective As a student I have often felt that I was merely tagged onto the teaching firms getting in the doctors way to be seen and not heard As a result I have found it difficult to motivate myself at times and have done only enough to get through the clinical course At MedSTAR students have a role and responsibility and a value that is recognised and thus is a great incentive to work hard and as a result learn

I can strongly recommended this elective to anyone not afraid of hard work whatever their career intentions Now that I am back in the UK preparing for finals the time spent at MedSTAR has given me a broader outlook on the practise of medicine No matter how busy or hectic things are on take with grumpy or sleep-deprived hospital staff I will be able to take comfort knowing that I am unlikely ever to have another night like my first night on MedSTAR

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The centenary of the sinking of the Mediterranean Fleet flagship, HMS *Victoria*. What was the role of Malta fever?

D J Vassallo

Abstract

This article commemorates the centenary of the tragic loss of the battleship HMS *Victoria* and 358 of her crew together with the Commander in Chief of the Mediterranean Fleet Vice Admiral Sir George Tryon as a result of an enigmatic order by Tryon himself It also investigates the medical aspects and explores the contention that Tryon was suffering from Malta or Mediterranean fever (Brucellosis)

INTRODUCTION

This year marks the centenary of one of Britain's greatest peacetime naval disasters the collision in calm seas off the coast of Syria on the 22nd June 1893 between two of Her Majesty's finest battleships the *Victoria* and the *Camperdown* the flagships of the First and Second Divisions of the Mediterranean Fleet This disaster resulted in the loss of the *Victoria* and 358 of her crew including the Commander-in Chief of the Fleet Vice Admiral Sir George Tryon and shocked the nation as much as the loss of the *Titanic* twenty years later

Tryon's enigmatic order to the two divisions of the Fleet to reverse course by turning inwards towards one another led directly to the collision and the controversy surrounding this order still engenders heated debate and speculation [1] This article describes the event and explores the contention that Tryon was suffering from Malta Fever adding its own twist to this speculation

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BACKGROUND

The Admirals

Vice-Admiral Sir George Tryon[2] (*Figure 1*) George Tryon was born at Bulwick Park Northamptonshire on the 4th January 1832 He was educated at Eton and joined the Royal Navy at the age of sixteen He was a colourful and charismatic figure zealous and full of life and energy By 1893 he was at the pinnacle of his career and was looked upon as the most outstanding naval officer of his day having been appointed in 1891 to the senior sea going command of the world's largest navy as Commander in Chief of the Mediterranean Fleet In this position he was well placed to put into practice his revolutionary theories especially an unorthodox supplementary system of signalling known as TA whereby once the code flags TA were raised the ships of the fleet would simply observe and copy the flagship's own movements It was Tryon's belief that this would almost always be what was required of a fleet in action This was designed to drastically speed up communication and encourage initiative among his captains There was something in him that inspired his subordinates with confidence in every order and direction that he gave.[3]

Rear-Admiral Albert Hastings Markham[4] (*Figure 2*) Albert Markham was born at Bagneres de Bigorre in the Pyrenees on the 11th November 1841 He was accepted as a cadet into the Royal Navy at the age of fourteen and was initially sent out to the China station taking part in many actions against pirates He later developed a taste for Arctic exploration and

Figure 1 Vice Admiral Sir George Tryon

after a successful expedition in 1875 76 he wrote a book called *The Great Fro en North* In January 1892 he was appointed Rear Admiral to Vice Admiral Sir George Tryon There was a marked difference between the two men Tryon being totally self confident charismatic and domineering while Markham was a quiet individual anxious to please his superior and somewhat diffident

The Ships

The *Victoria* was a 1st class battleship of 10 740 tons the pride of the Royal Navy She had been launched in the Queen s Golden Jubilee year and Her Majesty had been presented with a magnificent silver scale model of the ship by the officers of the Royal Navy and the Royal Marines She was said to be the most powerful ironclad afloat the fastest and one of the largest She was the most strongly protected with a solid eighteen inch wall of compound steel amidships and the most heavily armed with massive 111 ton 16 25 inch guns She had been only three months old when Sir George Tryon had assumed command of the Mediterranean Fleet on 21st September 1891 and raised his flag in her

The *Camperdown* was named after the Battle of Camperdown fought on the 11th October 1797 between the Dutch and English navies She

Figure 2 Rear Admiral Albert Hastings Markham

was built at Portsmouth and completed in 1889 Her displacement was 10 600 tons she carried four 67 ton guns six 5 ton guns and several smaller ones She was commissioned at Portsmouth in 1892 for service in the Mediterranean Fleet

THE DAY OF RECKONING

On the 22nd June 1893 the combined First and Second Divisions of the Mediterranean Fleet were lying at anchor in calm seas off Beirut on the coast of Syria The flag of the Commander in Chief Sir George Tryon was flying in the *Victoria* flagship of the First Division and the flag of Rear Admiral Markham was flying in the *Camperdown* The Fleet weighed anchor at quarter to ten in the morning and set sail for Tripoli less than sixty miles up the Syrian coast

The fatal order

Shortly after 2 pm on that fateful Thursday as the Fleet was approaching Tripoli Tryon summoned his Flag Captain Maurice Bourke and the navigating officer of the *Victoria* Staff Commander Thomas Hawkins Smith to his cabin There he stated that he would form the

Fleet into columns of two divisions and then invert the course of the columns by turning inwards 16 points (i e *through 180 degrees*) leaders together the rest in succession He would also place the columns six cables (*twelve hundred yards*) apart for this manoeuvre Hawkins-Smith then remarked that the columns should be eight cables apart for this (seeing that the *Victoria* s turning circle was three cables and that the combined turning circles of the *Victoria* and the *Camperdown* were not less than eight cables) To this the Admiral replied Yes it shall be eight cables and the Staff Commander then left for the fore bridge with his charts

Tryon then summoned his Flag-Lieutenant Lord Gillford and told him Will you make a signal to form columns of divisions line ahead columns disposed abeam to port and make the columns six cables apart handing him a piece of paper on which he had scribbled the figure 6 to emphasise this point When this signal was flown it was seen by Hawkins Smith who knowing the Admiral had expressed his intention to separate the columns by eight cables thought that the Flag Lieutenant had either made a mistake or that the Admiral had momentarily forgotten his intention The Staff Commander therefore asked the Flag Lieutenant to check this distance with the Admiral Lord Gillford went down to Admiral Tryon s cabin finding Captain Bourke still with the Admiral and said The Staff Commander asked me to remind you that you had agreed to eight cables sir You certainly said it was to be more than six cables sir added Bourke anxiously

To which questioning of his orders the autocratic Admiral replied Leave it at six cables And so the signal remained and the Fleet positioned itself accordingly

As the Fleet entered the bay of Tripoli the signals to reverse course were prepared There was no single signal in the book to cover the evolution Tryon had planned and it had to be made as two separate orders one to each column Thus at 3 25 pm the *Victoria* s yeoman sent on the following

Second Division alter course in succession 16 points to starboard preserving the order of the fleet

and *First Division alter course in succession 16 points to port preserving the order of the fleet*

Upon the *Camperdown* delayed in acknowledging this signal implying that Admiral Markham had not understood it Tryon therefore ordered the yeoman to semaphore to the *Camperdown What are you waiting for ?* and to show her pendants as a public rebuke Almost immediately the *Camperdown* signalled her acknowledgement and at once the *Victoria* s signal was made executive by being hauled down

The collision (*Figure 3*)

The next few minutes are best depicted by some of the words of John W Sherwell in his poem The *Victoria* In Memoriam June 22 1893 which appeared in the United Service Gazette two weeks after the tragedy

Ploughing the blue in their columns of battle
Never a thought there of aught of disaster
Till by mischance that was fearful and fatal
Bore down the *Camperdown* — bare down to order
From the *Victoria* — ought to have passed her
Bow-on the *Camperdown* came full weigh toward her
Struck her to starboard full on her fore turret
Struck with a thunderous shock and a shiver
Then backed from the blow with a tremorous quiver
Of shame for the involent deed
God help them all there in the hour of their need!

But twas over in a moment — though all through the time
Whirled the blades of her screws to a murderous rhyme
And the furnace flames flew in a fiery thirst
And her steam towers roared as though they would burst
With her stokers and engine men prisoned beneath
Doing in death in the vaporous breath
Till her bow went from under us over she swung
And the knell of three hundred seamen was rung!

THE COURT MARTIAL [1]

The court martial which assembled on board Her Majesty s Ship *Hibernia* at Malta on the 17th July 1893 and sat until the 27th to inquire into the loss of the *Victoria* went most exhaustively into the subject and examined as witnesses all the survivors who could throw the smallest light upon the disaster It was presided over by Admiral Sir Michael Culme Seymour the new Commander in Chief of the station Captain A L Winsloe of HMS *Hawke* was sent out from England to act as prosecutor

Figure 3 The loss of HMS V[illegible] [illegible]ed from *The Graphic* 8th July 1893 (courtesy of The British Library)

Notwithstanding that the court was directed to try Captain Bourke and the surviving officers and ship's company of the *Victoria* for the loss of their ship it was generally felt that Rear Admiral Markham and Captain Johnstone of the *Camperdown* were also indirectly on trial Their position was a peculiar one as they could not claim the right of calling or cross examining witnesses which the law allowed to the nominal prisoners

Nonetheless Admiral Markham who took upon himself the entire responsibility for the movements of the *Camperdown* was allowed to be present in court Although he was not allowed to cross examine witnesses himself or to make any statement in his defence he was permitted after he had given his evidence on the third day to suggest questions which if the court thought proper they then put to the witnesses In this way he was enabled to bring out points which he considered would exonerate him from blame On the other hand Admiral Tryon was dead and could obviously not speak in his own defence nor had he divulged to his subordinates the exact nature of the manoeuvre he had planned in his mind — it being his custom never to do so until after manoeuvres when he would discuss all the intricacies with his Captains in the comfort of his cabin Thus no one will ever know exactly what he had intended by his order and whether he was truly to blame for the collision resulting from the interpretation of his signal by Admiral Markham

The *Hibernia*

Her Majesty's Ship *Hibernia* which held the world's news headlines as the setting for the most important naval court-martial of the century was at the time the second oldest ship in the Royal Navy the oldest being another first rater Nelson's famous *Victory* She was one of the largest three deckers built for the Royal Navy during the Napoleonic wars and originally carried 120 guns She had a very distinguished career taking part in the blockade of Brest and the Tagus in 1807 and in the attack on the batteries of Cassis in 1814 She had also flown the flag of several famous admirals Since 1855 she had been the Base Flagship at Malta though in her dotage she had been relegated to providing spare accommodation for transient ships companies She will however be remembered for the court martial held on her poop deck long after her battle honours have been forgotten

She was to feature once more in history In

October 1902 she was sold for scrap and many of her heavily painted wooden timbers were sold to Maltese bakers who at the time used very primitive ovens The next year a widespread mysterious acute illness broke out amongst the population This was soon diagnosed as lead poisoning and the source was traced to the timbers of the *Hibernia* This epidemic has been fully described in a previous issue of this Journal[5]

The Protagonists

Admiral Markham Markham was the most important witness at the court martial for it was felt that he was unofficially as much a defendant as Bourke When asked how he had interpreted the signal to turn hoisted on the *Victoria* and to explain his delay in acknowledging the signal it became painfully evident under skilful cross examination that he was bewildered by the signal and that he had remained confused and uncertain even after acknowledging under the pressure of Tryon s subsequent rebuke that he had understood it On receiving this acknowledgement the *Victoria* had made the order executive and had immediately put her helm hard over The *Camperdown* had then begun her turn on a slightly wider arc towards the flagship and only then had she semaphored a response to Tryon s demand *Did not quite understand the signal* [1] Markham argued that he had interpreted the signal as meaning He must be going to circle round us passing us on the port hand [1] thinking that there could be no other interpretation and that he had therefore attempted to circle within the turn of the *Victoria* aiming to cut across her bows

The evidence of Markham s Flag Captain Charles Johnstone and of his Flag Lieutenant was also unsatisfactory and contradictory and the Court was left with the feeling that the *Camperdown* had been rather badly handled

Admiral Tryon Admiral Tryon s last words as remembered by two senior officers of unquestionable integrity determined the final verdict of the court martial Tryon s Flag Lieutenant Lord Gilford who had queried the original distance of six cables was questioned by the Prosecutor Did you hear the Admiral at any time after the collision pass any remark as to whom if anyone he blamed for having caused it or suggest any reason for its cause To this Lord Gilford replied after hesitating The Admiral said *It was all my fault* Later the Prosecutor asked Tryon s Staff-Commander Thomas Hawkins-Smith Who remained on the bridge after the collision? and Hawkins Smith replied that only he and Lord Gilford had been left with Tryon There was no conversation but he made use of an expression he volunteered He said *It is entirely my doing entirely my fault*

The findings

The pertinent findings of the court martial were as follows

1 The Court finds that the loss of Her Majesty s Ship *Victoria* off Tripoli on the coast of Syria on the 22nd day of June 1893 was caused by a collision with Her Majesty s Ship *Camperdown* and it is with the deepest sorrow and regret that the Court further finds that this collision was due to an order by the then Commander in Chief the late Vice Admiral Sir George Tryon to the two divisions in which the fleet was formed to turn sixteen points inwards, leaders first the others in succession the columns at that time being only six cables apart

3 The Court finds that no blame is attributable to Captain the Hon Maurice Archibald Bourke or to any other of the surviving officers and ship s company of Her Majesty s Ship *Victoria* for the loss of that ship and doth therefore acquit them accordingly

4 The Court feels strongly that although it is much to be regretted that Rear Admiral Albert Hastings Markham did not carry out his first intention to semaphore to the Commander in Chief his doubts as to the signal it would be fatal to the best interests of the Service to say he was to blame for carrying out the directions of his Commander in Chief present in person

Thus the Court dealt with the urgent public need to identify a culprit by settling the blame for the disaster and the loss of life fully onto Admiral Tryon who with true poetic justice was deemed to have paid the price with his life and also with his reputation The most charitable and widely held conclusion then and since has been *Humanum est errare*

Professional ruin of Markham

There was however considerable astonishment at the leniency shown to Markham by the court martial This following considerable agitation by influential officers the Admiralty reviewed the proceedings and findings of the court-martial publishing on Admiralty Minute on the 29th

October 1893 which was reprinted in *The Times*[4] the relevant part being

3 Their Lordships concur in the feeling expressed by the Court that it is much to be regretted that Rear Admiral A H Markham did not carry out his first intention of semaphoring to the Commander-in-Chief his doubts as to the signal but they deem it necessary to point out that the Rear Admiral's belief that the Commander in Chief would circle round him was not justified by the proper interpretation of the signal

Markham's career was blighted as a result. Even though he attained the rank of full Admiral and was made a Knight Commander of the Bath in 1903 he was permanently saddened by the *Victoria* disaster and never quite regained even his old love of exploration and travel. He did however become prominent in the world of Freemasonry being appointed Grand Master for Malta and in 1896 became the Founder and the First Master of the Navy Lodge[5]

THE CONTROVERSY (*Figure 4*)

What was the correct interpretation of Tryon's signal? One common misconception is that the ships were each to turn tightly in towards one another forming up abreast only a few yards apart hence the concern by Hawkins Smith about the combined turning circles. This would be an impossible and exceedingly dangerous manoeuvre that Tryon certainly could not have contemplated.

The all important clue emphasised by Hough in his book Admirals in Collision lies in the order *preserving the order of the fleet*.

Markham had interpreted the signal as meaning that the *Victoria* should circle around the *Camperdown* keeping the *Camperdown* to port and this would certainly have preserved the order of the fleet.

But there was one other way to preserve the order of the fleet and this was for the *Victoria* to turn *inside* the turn of the *Camperdown* for this would still end with the *Camperdown* to port. This theory was initially put forward by Mr W L Clowes in a letter to *The Times*[4]. Mr (later Sir William Laird) Clowes was a noted naval historian who later wrote the monumental history *The Royal Navy* wherein he convincingly expounded this alternative manoeuvre[3] and his views carried considerable weight. This would certainly have been a safe and feasible manoeuvre and may very likely have been the one intended by Tryon.

If so there has been a grave miscarriage of justice.

The Medical Aspects

Was Tryon ill? The United Service Gazette mirroring the public's bafflement at the apparent inexplicability of the disaster postulated that the case exemplified the well-known aphorism of Euripides *Quos Deus vult perdere prius dementat (Whom God would destroy He first makes mad)*[15]. Admiral Tryon had many sincere and very influential friends who were deeply saddened at his death and the sinking of the *Victoria* and anxious to come to his defence. Foremost among these was the highly respected Admiral Sir Geoffrey Phipps Hornby[6]. In an article written before the court martial had pronounced sentence but published immediately afterwards in The Fortnightly Review of 1st August 1893[7] and reprinted in the monthly The United Service of October 1893[16] Admiral Hornby effectively championed the same interpretation of the signal as Mr Clowes but also speculated that Tryon had suddenly fallen ill.

Admiral Markham's published letter[9] can I think leave no doubt in any one's mind that the grievous loss was due to an ill judged order. But that order was given by a man who had for years been celebrated for his good judgement. We are told he had lately been suffering from fever but that his medical attendants thought he had recovered. But is it not more reasonable to suppose that a slight mistake may have been made here[7]? *I apprehend that such casual faltering can be ascribed to nothing else than sudden illness*. And referring to the unorthodox order he goes on to say *the very use of these two signals is an indication how far Sir George was at the moment he ordered it to have been from himself*.

And at the same time in a separate article in the United Service Magazine[6,14] and quoted in The Malta Chronicle Admiral Hornby speculated that Tryon was specifically suffering from Mediterranean Fever. We know Sir George had been suffering very lately from fever and I happen to have had painful evidence of how virulent Mediterranean fever has been during the last two years. *I have no doubt he was so suffering, and gave his orders in complete forgetfulness*.

These public comments by Admiral Hornby in these widely read Service magazines greatly influenced public and medical opinion leading

to widespread speculation (which has persisted to this day) that Tryon had in fact been suffering from Mediterranean or Malta Fever — the causative organism of which had only just been discovered by Surgeon Major David Bruce in 1886 [3] but whose mode of spread was still unknown. It was after all well known that the other main protagonist involved in the tragedy

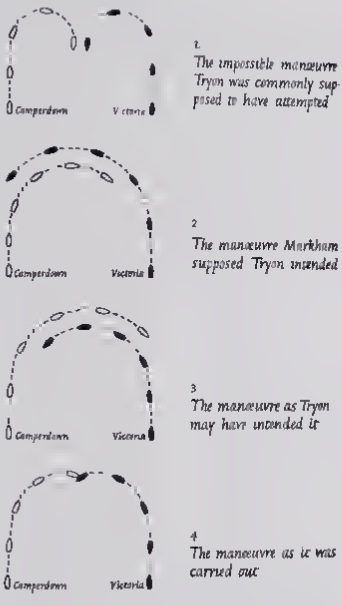

Figure 4 Interpretations of Tryon's Signal (courtesy of White Lion Publishers)

had just returned to duty after a debilitating attack of the same fever. It now appeared that this mysterious illness which had already affected thousands of soldiers and sailors of the Mediterranean Garrison had critically impaired the judgement of the foremost Admiral of the Royal Navy.

However there is no evidence in Tryon's biography that he had suffered from fever at any stage during his sojourn in the Mediterranean. Moreover this contention is firmly rebutted by the evidence of Admiral Tryon's own Fleet Surgeon during the court martial proceedings of Friday 21st July 1893 as reported in The United Service Gazette:[4]

Mr Herbert Mackay Ellis Fleet Surgeon of the *Victoria* testified to having attended Vice Admiral Tryon who was suffering from a small ulcer of the leg for nearly a month previous to the disaster. He last saw the Commander in Chief on the day of the accident when he informed him that it would be cured in a couple of days. *So far as he was aware the Admiral was suffering from no other ailment* (author's italics).

The Court Martial Proceedings[5] goes into even more detail on the examination of Fleet Surgeon Ellis though strangely there was no enquiry as to Tryon's health in preceding months.

Q 1155 By the Court. Do you think that the ulcer the Admiral was suffering from affected his general health? — No. I saw no signs of it. I had been in the habit of seeing him every morning for nearly a month and on these occasions the Commander in Chief used to introduce some general subject to talk about. I could not help on these occasions admiring the great versatility of his mind and the accuracy and range of his general information.

Q 1156 He had not had any fever? — None at all.

Q 1157 You do not think his health had been affected by the hot weather? — I saw no signs of it.

Fleet Surgeon Ellis had while ashore attended the meetings of the Malta Branch of the British Medical Association and as recently as 4th April 1893 he had congratulated Surgeon Captain Hughes on his paper 'On the prevalence of Mediterranean Fever among the Civil Naval and Military Communities of Malta with special reference to its endemic and epidemic characters.' This together with his testimony at the court martial shows that he was certainly no stranger to Malta or Mediterranean Fever.

This evidence coupled with the fact that Admiral Tryon had just a few hours earlier carried out true to form a complicated naval manoeuvre and Clowes perfectly feasible alternative interpretation of Tryon's order, effectively lays to rest any speculation that Admiral Tryon was ill.

Faced with the lack of any concrete evidence of physical illness psychologists have had a field day analysing the characters involved, interpreting this disaster as the seemingly inevitable result of a clash of personalities. As Dixon was to say in his book 'On the Psychology of Military Incompetence':[6] *'The Victoria disaster which was even excused on the grounds that orders must be obeyed illustrates more clearly than any other mishap the differences in nature and origin between the progressive autocrat and the reactionary authoritarian and how the clashing of these personality types can lead to tragic consequences.'*

A twist to the tale

But was Malta Fever the culprit after all: the real villain of the piece?

After the winter's sojourn in Malta Rear Admiral Markham had left Grand Harbour on the 7th January 1893 under orders to sail east with his Second Division. But early in February he was struck down by a particularly fierce attack of Malta Fever complicated by severe rheumatism which left him debilitated and unfit for sea going service. He underwent a prolonged convalescence at Fiume and Athens and the health resort of Taormina in Sicily before he considered himself fit enough to comply with Tryon's order to proceed to Malta where he joined the *Camperdown* on the 24th May. Queen Victoria's birthday just four weeks before the fatal collision.[8]

The author contends that it is possible that Rear Admiral Markham had still not fully recovered from his debilitating bout of Malta Fever by that fateful 22nd of June which would explain his slowness to react under pressure and increase the chance of his having made an error in interpreting Tryon's signal. And if so then history has done an injustice not only to Vice Admiral Tryon by making him the scapegoat but also to Rear Admiral Markham for a man is not guilty of the effects of an illness. It is also conceivable that Admiral Hornby had heard that an Admiral (in reality Markham) was recently ill with Malta Fever and assumed it was Tryon hence his linking Tryon to Malta Fever in his articles.

CONCLUSION

In the perceived opinion of the time rightly or wrongly the loss of the Royal Navy's mightiest battleship and most famous naval officer was inextricably linked to the mysterious microbe of Malta Fever now known as Brucellosis. This drew worldwide attention to the havoc this illness was causing to the Mediterranean garrisons and thereby played a catalytic role in the institution eleven years later of the Mediterranean Fever Commission which succeeded in identifying goats' milk as the vehicle of infection.

Lest we lose sight of the scale of the human suffering and loss in life at this disaster, let us recall the reaction of Queen Victoria who had been more closely associated with the *Victoria* than with any other battleship in her Navy on receiving the news at Windsor. She at once despatched a message to the First Lord of the Admiralty Lord Spencer expressing her deepest grief. 'Our heart bleeds for the many homes which have been plunged into mourning and deep affliction by this dreadful misfortune.'

At least the crew of the *Victoria* did not die in vain for the attention thereby drawn to Malta Fever ultimately led to its eradication. In this centenary year it is therefore fitting to conclude with John W Sherwell[7]:

> Then honour them all
> *In aeterna memoria*
> They that went down in the hapless *Victoria*

ACKNOWLEDGEMENT

I am indebted to my father Dr Luis Vassallo for alerting me to the controversy surrounding this naval tragedy and for his encouragement and help with criticism of this article.

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Malta and the British Navy: the medical connection during the nineteenth century Part III. Medical and other problems

C Savona Ventura

INTRODUCTION

In Part I of this paper we learnt about the establishment of the naval hospital at Bighi and then in Part II were introduced to some of the medical practitioners who had made their mark on the Maltese scene during the period under review. Now in this third and final section we shall examine some of the medical and other problems faced by those who were associated with Malta and the Mediterranean Fleet during the nineteenth century.

LOGISTICS

The logistics of supporting the fleet was complex. Routine provisions were issued to officers and men alike since according to the regulations all were to be equal to point of victualling. The captains however usually took on board their own supply of wine as well as goats, cows and hens to provide some luxuries which on occasion were given to the sick. The chief problem confronting those responsible for the victualling was the preservation of food in casks. Whether the provisions remained sound depended on the state of the ship, the area in which she sailed and the honesty of the contractors. Bad victualling was one of the causes of the naval mutinies of 1797. The fighting ships of war depended on reliable supplies of food and water particularly from the area of conflict. During the Napoleonic Wars at the turn of the nineteenth century (1793–1815) the scale of victualling for the British Mediterranean Fleet is amply illustrated by the accounts of the Agent Victualler's purchases between February and September 1804: 505 047 pieces of fresh beef, 379 sheep, 21 300 oranges, 81 685 lbs onions, 119 015 gallons of Spanish wine and 30 326 gallons of brandy. The problems of supplying blockading ships are exemplified by a letter sent in July 1799 by Sir Alexander Ball to Nelson with the ship *Benjamin* which was leaving Malta because its food supplies were nearly finished.

SCURVY

The problem of supply, particularly of fresh fruit to prevent scurvy, was a persistent one even in the Mediterranean. In June 1804 Dr Snipe requested permission to visit Sicily to supervise the contract for 30 000 lemons, while in the following January he wished to add 30 000 gallons of juice at 1 shilling a gallon which the contractor declined. Snipe then ordered 20 000 gallons at 1 shilling and 6 pence a gallon for the Fleet and a further 50 000 gallons to be sent to England when this volume became available. His concern towards the regular supply of citrus fruit can also be seen in his letter to Nelson regarding the Naval hospital site wherein he comments that Villa Bighi had sufficient ground belonging to it in a high state of cultivation to produce an

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abundance of vegetables for the use of the sick and that if lemon and orange trees were planted the Fleet on the Mediterranean station might be amply supplied with the antiscorbutic fruit

Scurvy was only eradicated from the British Navy after 1804 though it recurred when lime juice replaced lemon juice during long voyages limes having only half the amount of ascorbic acid per 100 g of raw fruit as lemons or oranges The first controlled experiment from which our present knowledge of ascorbic acid derives was made in 1753 by Dr James Lind who showed that scurvy could be cured by giving patients this fruit During his voyages round the world between 1772 and 1775 Captain Cook kept his ship s company free from scurvy by giving them abundant fresh food Scurvy was produced experimentally in guinea pigs in 1907 and ascorbic acid was isolated from lemons in 1932 with its structural formula being worked out in 1933 leading to its synthesis the same year

BREAD AND FLOUR

One staple item of the sailor s diet in the early nineteenth century was the ship s biscuit or hard tack since the baking of fresh bread at sea was considered impractical by the British naval authorities until the middle of the nineteenth century This food was frequently heavily contaminated by weevils

Malta featured indirectly in the history of fresh baking of bread abroad In 1845 one Henry Jones proprietor of the Western Biscuit Bakery in Bristol took out a patent for making self raising flour He subsequently sent 30 sacks of this flour as a sample to the Victualling Office for trials abroad but there appeared to be little response He then invented a simple machine for preparing flour on board ship This was put on the *Porcupine* for a trial and a favourable report was made two years later However the Admiralty declined the offer to purchase the machine In 1849 Jones asked for the machine to be returned to him and was informed six years after he had originally sent the machine that it had been traced to Malta where it had been destroyed Compensation was only made after continuous pressure by Jones Henry Jones Patent Flour — the original self raising was only adopted by the Admiralty Victualling Office after the Crimean War

FEVER

Scurvy and fever march together throughout the naval history of the eighteenth and nineteenth centuries Both [illegible] called forth the extremes of human misery the one weakening the body so that the latter could easily take hold The fevers affecting the Mediterranean fleet landing in Malta during the first part of the nineteenth century were described by William Burnett In his account published in 1816 Burnett describes a number of fever epidemics which occurred in British ships The first reported episode of fever in Malta dated to May 1799 among the crew of the ship *Goliath* Another episode was reported during the summer of 1800 in the *Athemai*

Burnett described this fever to the crew s exposure to the sun and by no proper use of the lancet in the early stages joined by purgation they all speedily recovered none died nor was sent to the hospital during two years During his term of office as Physician to the Mediterranean Fleet Burnett reported on fever epidemics in the *Eagle* (December 1810) when fever of a typhoid nature affected 60 of the crew who were admitted to the naval hospital where all recovered following repeated bleeding purgation and epigastric blistering in the *Alceste* and the *Scout* when there was fever involvement of abdominal viscera and frequent stools and in the *Pomone* and *Weasel* (June 1911) when there was deep yellow suffusion of the skin vomiting epigastric pain loin and lower limb pains Burnett further reports that during the period 1 April to 23 May 1812 153 men from the *Victorious* and the *Trident* were treated in the naval hospital for fever with eight fatalities In a further publication Burnett records for the first time the clinical picture of undulant fever although he refused to distinguish between one fever and another all of them in his opinion being malarial in character In line with prevalent thought Burnett advocated energetic or active treatment Venesection certainly had pride of place in his system on one occasion he boasts of taking 90 oz of blood from the temporal artery in six hours on another since the patient was strong and vigorous 16 lb of blood was taken in eight days He believed also that yellow fever was merely a malignant form of malaria and that treatment should consist of bleeding and purging postponing the use of quinine if used at all to the later stages of the disease[4 5]

The aetiological cause of these fevers was believed by Burnett to be due to the influence of offensive exhalations or miasma arising from marshy ground — hence mal aria He wrote that it had been observed that ships fitting out at the dockyard at Marsa were more subject to attacks of fever than those lying out at their

anchors and that by moving a ship into Pigh Bay the disease would cease. In addition he believed that fever could be precipitated by such causes as intemperance in the use of wine and spirits, exposure to the sun and to night dew. This view persisted well beyond the end of the nineteenth century so that in 1904 it was remarked that Mediterranean fever was not carried by water as was enteric fever, but by some aerial influence. Opponents of Burnett's infectious views included the army doctor Dr William Pym who served in Malta as Superintendent of Quarantine and later as President of the Board of Health. Pym believed in the contagious character of yellow fever and favoured the adoption of quarantine measures[4].

UNDULANT FEVER

Malta Mediterranean or undulant fever was a disease which attracted little attention for a long time, partly because it was so difficult to distinguish from enteric or malarial fever, and partly because of its low mortality rate. During the nineteenth century a large fleet was always stationed in the Mediterranean and there are repeated allusions in the naval annual reports to a fever characterised by long intermissions, anaemia and rheumatic pains. The clinical course was described by Burnett in 1816. The Naval Health report for 1860 records that Malta harbour and the adjacent sea always seemed to produce an unfavourable reaction in the crews, while in 1864 the report carried a detailed account of the disease. The surgeon speaks of Malta fever as it is ordinarily termed, which was responsible for 611 cases that year. He describes the symptoms as progressive emaciation over a period of weeks or even months, with frequent relapses and says that it is most common in the summer and early autumn. Quinine he found to be useless, the only cure being a change of air. He and others thought it was due to the sewage in the Grand Harbour or since it was similar to enteric or typhoid due to a defective water supply, one water tank having not been cleaned for nine years[4,5]. Further advances in the disease were made by army surgeons, the organism being identified in the human spleen in 1886 by Colonel David Bruce. In 1904 a commission of enquiry was set up by the Admiralty, the War Office and the civil government of Malta. Their report included the findings of Sir T Zammit of the Malta Board of Health, who showed that the main source of infection was goat's milk. This report was followed by an order prohibiting the consumption of unboiled goat's milk thus markedly reducing the number of cases in navy and army personnel[6].

YELLOW FEVER

Yellow fever was not endemic to Malta, though during the period of the French blockade in 1798–1800 the villages of Malta were affected by a febrile illness termed demi tsfar or yellow fever, although the true infection cannot now be identified but may have been typhoid. Towards the end of 1804 yellow fever appeared in Spain and Gibraltar and caused considerable anxiety to the health authorities of Malta as some inhabitants of the Rock came to the island in the early stages of the outbreak. Quarantine measures ensured that the infection did not reach the islands. A connection between yellow fever and the islands was seen again in 1824 when an epidemic of the infection occurred in 99 sailors on board the *Rann*. The question arose as to whether the fever was imported from Malta or whether the sailors had contracted it at Sierra Leone before sailing for Ascension where the epidemic broke out. According to the evidence the fever only occurred after leaving the African coast. This epidemic which resulted in 32 deaths was described by Burnett[7].

Since its identification as a specific infection transmission by the *Aedes aegypti* mosquito yellow fever has never been diagnosed in Malta[8].

MALARIA

It is difficult to trace the history of malaria since the infection was referred to by a variety of names. The term malaria was first used officially by the Navy to describe the disease in 1861 and it was only in 1880 that the infecting parasite was identified. However malaria was probably endemic in Malta as mention was made in 1677 of a malignant fever and the mosquito carrier *Anopheles maculipennis* has been identified. Indigenous malaria was first reported in 1904/05 when several of the inhabitants were infected. This outbreak was attributed to infected British army units stationed on the Island having contracted the infection in Crete. A second outbreak of indigenous infection occurred in 1919/20 being attributed to Labour Corps men returning from the East. All other malarial infections reported in Malta were contracted elsewhere.

TYPHUS

Typhus was the inevitable concomitant of cold undernourishment overcrowding dirt and misery — conditions which prevailed wherever men's clothes were lousy and their constant companions were rats and was during the early nineteenth century one of the most prevalent killers of seamen although not then endemic to the Maltese islands. It was first reported in Malta in 1855 56 during the Crimean War when a soldier from the war area died a hospital attendant died from the infection the diagnosis being made on the basis of the post mortem findings. Another episode occurred in April 1861 when an Egyptian vessel with several cases on board entered Grand Harbour however the infection was contained. In 1920 a number of cases were reported from the ship *SS Panama* which docked in Malta. A number of the cases were hospitalised in Malta but the quarantine measures adopted were sufficient to prevent the spread of the disease. The infection became endemic to the Maltese islands following the typhus epidemic which occurred in October 1944[9].

TUBERCULOSIS

Tuberculosis has until recently been considered an occupational disease of seamen although it was not considered important before the nineteenth century. In the early years of the nineteenth century it was commonly believed that the Mediterranean climate was less conducive to pulmonary disease indeed it was the custom for consumptives to travel to the area for a cure. While serving as surgeon of the *Medusa* in the Mediterranean in 1852 Spencer Wells reported that during the previous decade he had noted that an average of 24 post mortems per year showed evidence of the disease accounting for 37 7% of the deaths of sailors. The corresponding figure for soldiers was 32% and for the civilian population 12%. Spencer Wells made an urgent plea for improvements to the ship's ventilation which was then dependent on windsails and hatchways recommending the use of Lieutenant Gilmore's canvas air funnels. His suggestion was refused on the grounds that the *Medusa* was too small. The problem of tuberculosis in sailors has prevailed well into the twentieth century.

VENEREAL DISEASE

Venereal disease was extremely prevalent in the Navy during the eighteenth and nineteenth centuries the high rate of incidence being undoubtedly due to the traditional habits of sailors and the conditions prevailing in the ports. The situation was no different in Malta. After the arrival of the Knights of St John the islands became a maritime centre and by 1551 Vittoriosa had become notorious for the number of Maltese and foreign prostitutes living there. Venereal disease was not uncommon its treatment being carried out at the falanga at the back of the Great Ward of the Sacra Infermaria by mercurial inunction and hot air baths. Legislation measures were devised to discourage and restrain prostitution including the enforced periodical medical examination of prostitutes — a practice that was introduced during the Order's rule and maintained during the first half of the nineteenth century under the British. By 1830 more than 150 women were being examined each month. As some of the women declined to submit to such an examination an ordinance was enacted in 1861 enforcing the compulsory examination of prostitutes and the treatment of infected ones in hospital where they were to be detained until they were declared cured. This system was considered so effective that the desirability of introducing similar measures elsewhere was raised in 1864 by a British Parliamentary Committee under the chairmanship of F C Skey. This committee was contemporary with the passing of the First of the Contagious Diseases Acts which laid down that women must submit to compulsory examination if information was laid against them provided that they resided in specific places in the United Kingdom where army or navy personnel predominated. The Skey Committee Report published in 1867 recommended the introduction of compulsory examination of prostitutes in all big ports and also recommended the compulsory examination of the genital organs of all service personnel [10].

CHOLERA

Cholera made its first definite appearance in the Maltese Islands in 1837 though sporadic cases were said to have been observed among British troops every year during the previous decade. During the 1837 epidemic which lasted from 9 June until 10 October 62 Naval cases and five deaths are recorded. A total of 8 785 cases are known to have occurred in Malta and Gozo with 4 252 deaths. The islands subsequently became notorious for epidemics of the infection throughout the nineteenth century with further outbreaks occurring in 1848 1850 1856 1865

1867 and 1887. These frequent outbreaks were the result of the increasing contact with north African and eastern Mediterranean ports, the previous immunity of the islands being attributed to the strictness of the quarantine regulations although cases may have occurred in the islands during the late eighteenth century. The last cholera epidemic in the Islands occurred in 1911[6,5].

SMALLPOX

Smallpox has existed along the Mediterranean littoral since at least the eighth century. Variolation inoculation against the disease was being practised in Malta in 1769 but the results were so disappointing that the procedure was prohibited by decree. Following Jenner's demonstration in 1798 of the safety of vaccination using cowpox inoculation this procedure received the official backing of the Maltese Government at the turn of the nineteenth century. When Dr Marshall arrived in Malta with the vaccine the Governor ordered that all naval personnel were to be vaccinated while a number of Maltese children were also inoculated in the presence of two Maltese physicians. By 1824 free inoculation was made available at the civil hospital.

An epidemic of smallpox occurred in 1830 being introduced from Naples into Malta by HMS *Asia*. The number of personnel affected was 11 351 with 1 573 deaths. Subsequent outbreaks occurred in 1837. Vaccination was made compulsory in 1855 but this law was not regularly observed by the population. Smallpox was again introduced in 1861 when 362 persons died. In December 1870 a ship from London arrived at Malta on her way to Trieste. The master informed the port authorities that he had two men suffering from smallpox. The diagnosis was confirmed and the men were landed and hospitalised. From the hospital the disease spread throughout the whole island and widespread vaccination was initiated. Over 1 000 naval officers and men were vaccinated with only three deaths occurring in the Fleet. Seven thousand civilians were affected with 700 deaths. Smallpox was only brought under control by the introduction of vaccination[9,5].

HYGIENE

The presence of infectious disease in a closed community such as the crew of a naval vessel is closely dependant on the general hygiene of the ship. The period between 1830 and 1860 has been described as the era of the Great Sanitary Awakening and it was inevitable that this movement should affect hygienic conditions at sea particularly in the Royal Navy since this was a public service resulting in a greater general cleanliness of the ships. A notable reform in personal hygiene occurred in 1857 when seamen received an official uniform based on the pattern that had come into general use, a feature that must have contributed to the decrease of louse borne disease.

Ship ventilation remained a problem well into the nineteenth century the matter becoming more urgent after 1861 when ships began to be made of iron. However improvements were only made as the century came to an end and the views of the engineer as well as the medical officer began to carry weight. As mentioned above Spencer Wells attributed the increased incidence of tuberculosis in the navy to inadequate ventilation but his recommendations for improvements were turned down.

The problem of accommodation for the medical officer in the close confines of the ship still remained a problem although the ship's surgeon was usually accommodated in a cabin adjoining the sick berth and dispensary. However in 1853 two assistant surgeons on British ships complained to the authorities that they had not been assigned a cabin[10,18].

Closely connected with the problems of ventilation and hygiene was the use of disinfectants of which various were used by the Navy. Sir William Burnett advocated the use of a disinfecting fluid composed of chloride of zinc but in 1867 this was superseded by carbolic and chloride of lime to destroy bacteria. For fumigation sulphurie or nitrous acid or chlorine gas were found effective. In Malta similar procedures were undertaken: ships with foul hulls of health were emptied of their cargo and all the port holes and hatches were opened to allow flushing of the interior by air. Decks and bulkheads were washed down with lime and water then painted and fumigated[10,17].

HERNIAE

Of all the occupational hazards to which seamen were exposed in the days of sail the commonest was that of hernia or rupture. Their work entailed tremendous physical exertion. In 1806 William Turnbull accepted that strenuous work was the most frequent cause of rupture but suggested that the excessive consumption of oil in the Mediterranean fleet and the hot weather

prevailing there might also have been contributory remarking that in Malta scarcely any person is exempted from rupture[1]

CONCLUSION

The Maltese-British Navy connection had two facets to its story with a give and take relationship On the negative side the role of the island as a Mediterranean link between the Indian and Atlantic Oceans served to aid the introduction of infectious epidemics to the island some of which have remained endemic On the other hand both Maltese and British medical practice gained from the relationship the British Navy ensuring that a number of enterprising young medical practitioners visited the Island leaving in many instances an indelible mark on local practice Not the least of these was Thomas Spencer Wells who introduced anaesthesia in Malta Furthermore the efforts of the British Naval authorities to combat the debilitating diseases affecting their sailors helped in the control and management of infectious disease particularly smallpox The Island on the other hand contributed towards the understanding of the value of a rigorous system of quarantine and of the rigid control of venereal disease by measures introduced in Malta by the Knights of St John

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Research — a personal reminiscence

W Holgate

In 1957 I was told by the Director of Dental Services Surgeon Rear Admiral (D) Fr mk Williams that I was to be appointed Director of Dental Studies and Research at the Royal Naval Medical School Alverstoke I was not very pleased because it meant giving up all the clinical dentistry which I enjoyed in my enrrent employment as Command Dental Surgeon in HMS Drake at Plymouth where I had managed to retain my own surgery It also meant an unwelcome upheaval for my family

I took up my appointment on 9 September 1957 My department was a small attic room lit by two dormer windows on the third floor of the house little altered since it was built in Victorian days and now the Royal Naval Medical School My attic was not large and except when looking out of the dormer windows there was only a small central area where one could stand upright

I had a staff of two — a WRNS typist for my secretary and a civ lian dent il technician called Mne Mac s workshop was in the half landing of the stairs leading to my attic On this was a cupboard about three foot square leading to the sloping roof space In this he had constructed a work bench and storage space for the materials he used and racks for the tools of his trade He couldn t get inside his workshop but sat on a chair outside it on the half landing

Needless to say the dental laboratory was always very tidy it had to be and Mac never grumbled or belly-ached about it During my life I have had many friends who have helped me and I still rate Mac very highly among them

I remember entering my domain for the first time and finding that my predecessor had completed all his projects there was a sparkling white blotting pad on my desk no appointments had been made for me and there was no indication that there was anything left for me to do In my imagination the next three years stretched blankly ahead — and how wrong I was! They turned out to be some of the most rewarding years of my life

Mac and I soon had a number of projects in hand Chiefly for recruiting purposes a mobile exhibition bench and stand was constructed which for ease of transport could be contained in two flat packing cases easily manageable by one person the hinged packing cases themselves forming the top of a trestle table Mac made a number of plastic models demonstrating various dental procedures for patient enlightenment and for lecture purposes which were used to dress the stand (*Figure 1*)

At this time the masks used for shallow water diving relied on the mouthpiece being held between the teeth We evolved a system of providing the diver with a tailor made mouthpiece which exactly fitted his occlusion and to do this I needed some soft black vela rubber In my early days as a dentist this was used to make the flaps fitted to a vulcanite denture to close the soft palate for patients with a cleft palate deformity When I tried to obtain some vela rubber I found that the dental supply companies no longer stocked it My friends in the Royal Navy Physiological Laboratory which in those days was quite close to the Medic il School thought that the Government Research Establishment at Porton Down might help and a visit was arranged for me Porton had a large rubber factory and the novelty of their having

Surgeon Rear Admiral (D) Holgate d ed on 16 June 1993 the paper has been publ shed at the request of h s family

a dental role seemed to amuse them. I finished up with a wonderful stainless steel electrically heated vulcaniser — it must have cost the earth!

From this experience I learned of the vast resources of the various government laboratories which served me in good stead after I had retired from the Navy and worked at the Ministry of Health where I was able to steer dental projects through the research establishments of the Government Chemist Porton Down and Aldermaston.

The design for the shallow diving masks was altered shortly after this so we used the electric vulcaniser to good purpose by providing tailor made mouth guards for the Portsmouth Command boxing team. They were very successful and for some time none of our boxers was knocked out by a point blow to the chin but they were eventually frowned on by the physical training instructors because the boxing experts came to the conclusion that the boxers could suffer too much punishment from head blows while the mouth guards were being worn.

During my appointment at Plymouth I had visited all the dental schools in the United Kingdom on a recruiting mission and as a result of this I was on christian name terms with their Deans. On reading in the *British Dental Journal* that Professor Geoffrey Slack at the London Hospital Dental School required information on adults who had perfect dentitions ie those who had no fillings or extractions and showed no visible disease of their alveolar tissues I offered to institute a trawl throughout the Royal Navy. My fellow RN dental officers were most co operative and we finished up with over 20 individuals who fitted his requirements. Geoffrey had asked for a questionnaire on eating and cleaning habits for each patient. I asked him to lunch and we went through the questionnaires seeking a common factor but some liked meat vegetables fats fruit sweets — and some didn't. Some brushed their teeth with an up and down motion some preferred side to side and some a rotary scrub. Some brushed in the morning some at night while others said they brushed after every meal(!) and one or two didn't believe in brushing their teeth. Some liked soft brushes some hard. However it was noticed that in all the models there were signs of crowding of the canine and incisor teeth — all were very close together and it was to this common factor that freedom from caries and gum disease could well be attributed.

Years later after I had retired from the Navy and was employed by the Ministry of Health Geoffrey had accepted the appointment of Honorary Consultant Adviser and he was a great help to me in laying down the acceptable very strict parameters for the dental inspections required for the Dental Health Survey in England and Wales in 1968. The Survey was the first of its kind in the world and with the same parameters was repeated in 1978 and 1988.

Another bit of fun I had was with the precursor of the present video cassette. I wanted to standardise the official obligatory dental lecture to new entries in the RN and RM teenage training establishments and I believed that something to laugh at was most likely to produce more co operative patients for the Royal Naval dental officers who treated them.

I wrote a script and engaged a comic strip artist to draw pictures which illustrated the points I hoped to make. The coloured drawings were then converted into lantern slides which could be led into a remotely controlled carousel slide projector. The recording studio wished to employ a professional actor to read the lecture but it was decided that I was likely to do it better because I had written the script. I went to a recording studio in Wardour Street and spoke my piece which resulted in a mould for a 24" gramophone record. We had no rehearsal — I apparently got it right first time but I still think the professional recordists were laughing too much to ask me to do it again.

I demonstrated this technique to an amused British Dental Association Committee investigating publicity methods for dentistry under the chairmanship of Professor Alex McGregor the Dean of the University of Birmingham Dental School.

Surgeon Commander Edmondson was in charge of the laboratory at RNMS when I arrived there. We had previously served together at RN Hospital Plymouth and become great friends. Ed was a bachelor and lived in a caravan parked in a discrete corner of the RNMS grounds. He was doing some work at the Medical Research Council Radiobiological Research Unit which was part of the United Kingdom Atomic Energy Research Establishment at Harwell and one day early in 1958 he invited me to go there with him. We had lunch in the canteen where he introduced me to Robin Mole the Deputy Director of the MRC Unit. After lunch Robin sought me out and showed me an autoradiograph of a monkey's jaw. We discussed it and I appreciated that there were special dental problems for which answers were required.

I rang him up the next morning and suggested

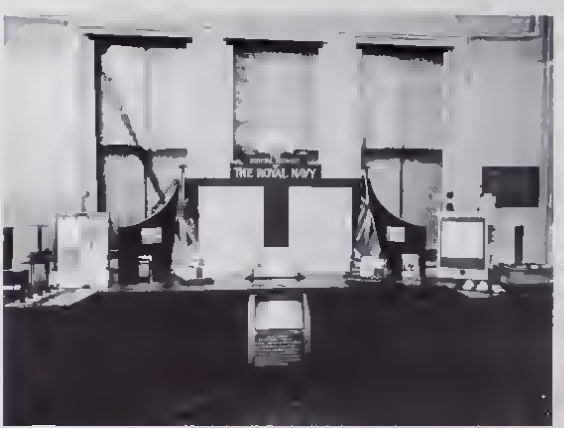
that as they had not got a dentist in the unit they needed one and that as my services would cost him nothing could I have the job please He made an appointment for me at Harwell but when I arrived asked me to drive him to Chirehill Hospital in Oxford where he introduced me to Dame Janet Vaughan — and for the next two years I learned what real research was all about and I began to feel that the Director of Research part of my official title was justified It was hard work but we produced papers which were published in *Nature* and in the *British Dental Journal* and I gave a keynote lecture at the Annual Conference of the British Dental Association at Torquay in 1959

It also led me to the United Kingdom Atomic Energy Authority Research Group at Woolwich outstation for whom I organised a collection of teeth which were analyzed and helped them to interpret the fallout of Sr90 following the nuclear bomb tests in the Pacific

More recently following the Chernobyl disaster Professor Bertram Cohen an old friend of mine at the Imperial Institute of Cancer Research saw that copies of our papers were sent to the Russians Bert prophesied that a number of the younger members of the Chernobyl workforce would shortly be losing their wisdom teeth

ENVOI

When I left the RNMS for the Admiralty Surgeon Commander Will Starkie took over my job He inherited a lot of unfinished business a full appointment book and no clean blotting paper on his desk!



Association of Service Physicians

The Thirteenth Annual Meeting of the Association of Service Physicians was held at the Royal Army Medical College, Millbank on 19 February 1993 and was attended by forty seven members and guests.

Air Commodore D H Hull Consultant Adviser in Medicine Royal Air Force took the chair for the first session. In the first paper Surgeon Lieutenant Commander C D Gillen gave details of a study in Birmingham into the risk of developing colorectal cancer in patients with Crohn's Disease and Ulcerative Colitis. This study indicated that the risk of developing colorectal cancer after 20 years or more of illness is as great in patients with extensive Crohn's colitis as in those with extensive ulcerative colitis. Young age at onset is an important risk factor in both diseases. The absolute numbers of Crohn's patients who develop colorectal cancer is relatively small as many undergo early surgical excision for symptomatic disease. In the second paper Surgeon Commander R W Smith gave details of a clinical and pathological study of Chrysiasis a slate grey bluish discolouration of the skin occurring in patients receiving gold therapy for rheumatoid arthritis. It appears to affect mainly the upper face and to develop when the cumulative dose of gold exceeds 45 mg/kg. The effect appears to be mainly cosmetic and may be confused with the skin discolouration of dermatomyositis and Amiodarone therapy. In the third paper Squadron Leader K P McKinlay described the acute and chronic effects of Mustard Gas exposure as seen in a small number of soldiers exposed to mustard gas in the Iran Iraq war who were subsequently treated at the Brompton Hospital. These patients developed progressive breathlessness recurrent chest infections and chronic cough following acute exposure and were shown to have bilateral bronchiectasis for which there was no other obvious cause. This has not previously been reported as a long term complication following acute exposure.

The second session was devoted to a Tropical Medicine Update given by four distinguished guest speakers who were introduced by the Director of Army Medicine Brigadier C D Cowan. In his talk on diarrhoeal illness Professor M J G Farthing stressed the persisting high mortality of these illnesses even in developed countries particularly in children. He described the exciting research into the roles played by 5 HT and ZOT (zona occludens toxin) in the development of diarrhoea provoked by cholera toxin and the encouraging therapeutic effect of some 5-HT antagonists. He mentioned the progress towards developing an oral cholera vaccine work on Rotavirus vaccines is less advanced. He also described developments in the use of hypotonic glucose electrolyte solutions for oral rehydration therapy and the addition of rice based or polymer mixtures to thicken and improve the efficacy of these solutions. Dr G C Cook then gave a rapid and concise review of the major worm infestations and their treatment drawing attention to some areas of concern such as the development of resistance of some strains of Schistosomiasis to Praziquantel. The expense of many of the newer antihelmithic preparations continues to limit their widespread use in poorer countries. Following this Dr A D M Bryceson gave an equally concise and comprehensive review of the current world distribution of Leishmaniasis in its differing forms and drew attention to its worrying co existance with and potentiation by HIV infection in certain areas especially Southern Europe. Sodium Stibogluconate remains the mainstay of treatment though Pyromomycin and Amphotericin are also useful. The toxicity of Amphotericin can be reduced by infusion with lipid. Finally Professor J A Wartel discussed malaria concentrating on Falciparum infection its varied forms of presentation and optimum treatment. Quinine remains the drug of choice including during pregnancy. Chloroquine resistance was discussed briefly (including the appearance of some resistant Vivax strains in the Far East) and also the work suggesting restoration of sensitivity by combining treatment with calcium channel blockers. The meeting concluded with lunch in the RAMC Headquarters Officers Mess.

[illegible] med Serv 1993 79 110 113

Letters to the Editor

Sir

An audit of resuscitation and anaesthesia during Operation Safe Haven

I read with considerable interest the paper by Rudland *et al* in the Winter 1992 edition of the Journal (Vol 78 133 140) which emphasises that sophisticated resuscitation anaesthesia and monitoring is now possible in the front line I would be grateful for the opportunity to set out my views on the use of blood and blood products in the SST setting

I concur that in severe trauma the use of blood is highly desirable for its oncotic and oxygen carrying properties but consider that except in certain circumstances the use of blood obtained on the spot is now outdated

At the 1992 NATO civil military blood conference it was the consensus view that red blood cells should be available at every level of field medical care that had a surgical capability The red cells should be provided by national blood transfusion services and be collected tested and stored in accordance with good transfusion practice In the UK the Army Blood Supply Depot (ABSD) is the Tri service authority responsible for obtaining and shipping blood The principle was followed for Royal Naval and Royal Army Medical Corps facilities during the Gulf War and the logistic arrangements proved effective and robust Using donors on the hoof leads to a risk of transmission of infection cell grouping errors haemolysis and rapid exhaustion of potential donors The time equipment and expertise required to set up a donor session is substantial All these factors contribute to the imperative for providing bank blood

The logistic problems of supply storage and re supply of blood are well recognised Current shipping techniques allow blood to be safely stored in transit for up to 48 hours before re packing existing Thermopol thermoregulating blood banks allow storage up to the expiry date and most blood has a life of 42 days As shown during the Gulf War waste is inevitable but preferable to difficult arrangements

One potential problem of using stored blood is the lack of active platelets and reduction in coagulation factors Unfortunately there is no published literature on the incidence of thrombocytopenia or coagulopathy among those subject to military trauma but research in civilian trauma suggests that these problems are unusual and often occur late and as a result of multi organ failure sepsis and other recognised precipitants However it was the NATO consensus that Fresh Frozen Plasma should be available at Field Hospital/3rd Echelon care and that platelets should also be available probably through apheresis of donors at that level All these proposals were incorporated into the facility in RFA *Argus*

In the future it is probable that the problems of time expiry of red cells will be met by the use of Hydroxy Ethyl Starch (HES) frozen red cells a technique developed at the ABSD and entering clinical trials in the US

Currently I believe that a SST on operational deployment should take blood storage facilities and initial blood stocks and that re supply arrangements are made at an early stage

I would support the need for blood warming preferably using dry blocks but strongly counsel against ever putting red cells into water above 37°C as even short exposure to higher temperatures will damage the red cells leading to in vitro or in vivo haemolysis and all its dire consequences

Finally I support the notion that more sophisticated laboratory equipment should be available to the SST and this is currently under review The RNMS provides highly trained personnel and it is right that they should be supported with blood blood products and laboratory facilities that will maximise their abilities to help those who sustain injury and disease

C M JAMES
Surgeon Commander Royal Navy
Consultant Haematologist and
Head of Pathology
RNH Haslar

(*The authors were* invited [illegible])

Sir

An audit of resuscitation and anaesthesia during Operation Safe Haven

We welcome the comments made by Surgeon Commander James supporting the need for sophisticated laboratory equipment and adequate blood storage facilities within the SST organisation while counselling on the risks of on site donation We were very aware of these risks

The SST deployed to Kurdistan with one Thermopol capable of storing 30 units of blood Re supply through the nearby airstrip was designed to be within three days of request Because we received multiple cases of severe trauma all reserves of stored blood were drained on two occasions before new stocks could arrive Only in these extreme circumstances were the recognised complications of on site donation accepted and fresh whole blood utilized in preference to crystalloid or colloid

Coagulopathy occurs most frequently in the severely traumatized hypothermic patient[1] and can be prevented by efficient warming despite massive transfusion Many of our patients in Iraq suffered a significant drop in core temperature because of inadequate facilities for warming intravenous fluids despite the high ambient temperatures We therefore assumed the presence of coagulopathy Accepting the objections raised fresh whole blood supplies coagulation factors which are deficient in stored blood carries oxygen more efficiently and is warm

We agree that blood should never be heated above 37°C and have already stated that when using simple warm water baths temperature must be strictly controlled This requirement should not preclude such a straightforward effective and simple technique of preventing hypothermia during massive transfusion in the field

If the SST were adequately equipped for blood storage fluid warming haematological and biochemical assessment then there would be no need to debate techniques and interventions that should ideally never need to be used We agree with the 1992 NATO consensus on the treatment of coagulopathy in the field but note that as the SSTs are not equipped for 3rd Echelon care the problems we encountered are likely to recur unless the solutions we have suggested are adopted

S V RUDLAND BMed Sci BM BS DA(UK)
Trainee in General Practice

S Q M TIGHE MB BD FFARCS
Surgeon Commander Royal Navy
Consultant in Anaesthetics

REFERENCES

1 Ferrara A MacArthur JD Wright HK Modlin IM McMillen MA Hypothermia and acidosis worsen coagulopathy in the patient requiring massive transfusion *Am J Surg* 1990 **160**(5) 515 8
2 Michelson T Salmela L Tegerstedt J Makelainen A Linko K Massive blood transfusion Is there a limit? *Crit Care Med* 1989 **17**(7) 699 700

Dear Sir

The recent emergence of ATLS[1] as the guiding principle behind trauma management in the United States and the United Kingdom has led to major changes in protocol in many accident and emergency departments

The ATLS program is concerned with the immediate management of trauma victims particularly in the first hour (the so called Golden Hour) of treatment The traditional ABC of immediate care is altered and augmented slightly with care of the cervical spine introduced early into the scheme The Primary Survey of ATLS is

Airway with cervical spine protection
Breathing
Circulation with control of life threatening haemorrhage
Neurological Disability
Total Exposure

Thus all patients are assumed to have cervical spine injuries until proven otherwise and all airway manipulations are performed with full cervical spine protection This may be afforded in one of two ways *either* manual in-line immobilisation *or* a combination of rigid cervical collar sandbags and tape placed across the forehead *Anything* short of these two alternatives is inadequate In addition no patient is moved without particular care of the spine being taken including log-rolling

First Aid teams on Royal Naval ships are trained in accordance with ABC principles[2] but up to now no particular import has been placed on the care of potential spinal injuries during the ABC sequence Indeed no particular import is placed on the cervical spine at all The equipment scale of medical supplies for RN ships from CVS down does not include equipment for immobilising the cervical spine properly such

is rigid cervical collars. There are personnel trained in techniques such as manual in line immobilisation or log rolling. The Neil Robertson stretcher is excellent for extricating patients with injuries from difficult locations but does not immobilise a patient's spine adequately for these purposes.

We believe that the ATLS program as a whole is *not* applicable to, or suitable for Royal Naval First Aid teams. We appreciate that ATLS is primarily intended for doctors in properly equipped casualty departments and that First Aid teams do not have the knowledge or experience to apply ATLS principles in field situations. However certain aspects of ATLS in particular those aspects of Primary Survey associated with the care of spinal injuries would be a valuable addition to the Primary Survey of the First Aider or Leading Medical Assistant. This would involve a relatively small alteration in training schedules. Equipment scales for all ships should be altered to include rigid cervical collars of appropriate sizes. As in the case of the ATLS program the adoption of fixed well rehearsed protocols by Royal Naval First Aid teams on ships and in the field may lead to improved outcome in the care of the acute trauma victim.

M D STONEHAM
Registrar

S Q M TIGHE
Consultant
Department of Anaesthetics
RNH Plymouth

REFERENCES

1. Advanced Trauma Life Support manual. American College of Surgeons 1989.
2. First Aid training in the Royal Navy. Handbook 11th. Royal Naval Medical Staff School 1989.
3. First Aid Manual — authorised manual of the St John Ambulance. 5th edition. London. Dorling Kindersley. 1987.

In view of the potential implications to Royal Naval First Aid training voiced by the authors the above letter was passed to Commander R A Pollard Officer in Charge Royal Naval Medical Staff School and Surgeon Commander C J Cahill Senior Specialist in Accident and Emergency for comment.

Sir

The Royal Naval Medical Staff School (RNMSS) as the Lead First Aid School to the Royal Navy and Royal Marines fully supports the sentiments expressed by the authors. Indeed we would go even further and state that in all cases of suspected cervical trauma the head and spine must be supported down to the pelvis with a spinal board that is firmly taped to prevent rotation.

However having said that the degree of theoretical knowledge required to properly implement the full ATLS protocol of airway management and cervical spine protection precludes its inclusion in the Level 2 First Aid syllabus. The emphasis of the training is on maintenance of the airway although it is stated that if there is a history of neck trauma and the circumstances permit, the casualty should not be moved until properly immobilised by a Medical Officer or Medical Branch Rating.

Work is under way to investigate the feasibility of the Amba rigid neck collar and the Kendrick Extrication Device (KED Board) both currently being used by the Hampshire Ambulance Service. Should they prove suitable a proposal may be submitted to the RN Stores Advisory Committee for them to be included in Ship's Scales. Establishments are not subject to Scales and could obtain them through the normal channels with the required quantity dependent on the number of ambulances held and whether a Disaster or SUBMISS plan is in operation. Following appropriate amendment and approval of the Training Specifications the use of these devices could be taught during the LMA Professional Qualifying Course and as the authors suggest would involve little alteration to the programme.

The authors may be assured that the RNMSS is aware of the problem and concur that anything that may improve the outcome in the care of acute trauma victims is worthwhile and will be vigorously addressed.
Yours faithfully

R A POLLARD
Officer in Charge
Royal Naval Medical Staff School

Dear Sir

Thank you for giving me the opportunity to comment on the above letter.

I fully support the content of the letter. I agree that the training of Royal Naval Medical Branch Ratings and First Aid Teams should reflect the widespread acceptance of the American College of Surgeons Advanced Trauma Life Support Program in this country and that Royal Naval ships and establishments scales of medical stores

shonld be altered to include the correct eqnipment for immobilisation of the spine especially semi rigid cervical collars This is partienlarly important as an increasing nnmber of Royal Naval medical officers are ATLS trained and the Service has accepted the raqnirements for ATLS training of doctors and has agreed to sponsor regnlar ATLS conrses at the Institnte of Naval Medicine

It may be of interest that the Royal College of Surgeons of England nnder whose anspices ATLS conrses are rnn in the United Kingdom have recently taken on the organisation and have introdnced Pre hospital Tranma Life Snpport Courses to this country These courses are specifically designed for paramedics and other pre-hospital carers involved in the management of trauma victims as opposed to ATLS which is specifically for qualified doctors As yet I have not been able to study the course contcat but I nnderstand that the aim is to ensnre the provision of care conforming to ATLS principles at the site of injury and throughout transfer to hospital I am snre that the core material for this course could be considered as a basis for modification of the trauma related aspects of Royal Naval Medical Branch training

It should be noted that Reference 1 to the letter is incorrect it should read Advanced Tranma Life Support Course Core Course 1988 American College of Snrgeons An npdated ATLS core content has been agreed and is dne to be pnblished in September 1993

Yonrs sincerely

C J CAHILL

(*Editorial note* It should perhaps be pointed out to Messrs Stoneham and Tighe that they are also a little ont of date with their other two References First Aid Training in the Royal Navy has recently been npdated and the 1992 revision is currently in use and the First Aid Manual of the St John Ambnlance is currently at the 6th Edition of November 1992)

Dear Str

Whilst in no way wishing to detract from the work carried out by the Medical Librarian at Haslar I feel that his article in the Spring 1993 issue of the Journal gives the impression that prior to 1986 there was not a recognisable medical library in Haslar

A separate Medical Library was created in 1964 when historical and current textbooks were separated Without this modern library the various Royal Colleges wonld not have given their recognition to the postgraduate training carried ont at Haslar

It was there during 1963 to 1985 that many of the services offered today were introduced for example the first photocopier in Haslar was in the Medical Library Inter-library loans Union catalogue of MOD holdings Wessex Regional catalogue of periodicals microfiche readers and a display of cnrrent jonrnals in alphabetical order are just a few of the changes I initiated

Whilst a believer in credit where credit is dne I wish the present medical Librarian every success in the future

C T PARSONS
Former Medical Librarian
RNH Haslar

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1 Rowe M Royal Naval Medical Library Service *J roy nav med serv* 1993 79 45-48
2 Parsons CT Haslar Museum *J roy nav med serv* 1985 71 117 120

Book Reviews

The Informed Woman's Guide to Breast Health Kerry A McGinn Pp 156 Californian Bull Publishing Co January 1993 Distributed by Gazelle Book Services Ltd Lancaster £11 50

Despite its title this book is written by an American Oncology nurse to inform lay women about breast health In 128 pages she does this thoroughly in a readable style The index covers eight pages so that subjects are easily located and cross referenced The 10 pages of glossary explain all the medical terms The thorough way in which Kerry McGinn deals with the subject is illustrated by the 20 pages (with illustrations) on breast self-examination Other topics covered are Fibrocystic disease mammography needle aspirations understanding breast cancer risks treating breast pain biopsies and breast carcinoma All these conditions are explained in simple everyday language and the facts and reference points are as pertinent in Alverstoke as in San Francisco It is not full of American idiom and research

We must all take care of our own health The Informed Woman s Guide to Breast Health informs and dispels fear so that many will see that most breast problems are not cancerous Written for women whose doctors are too rushed to answer their questions fully it is loaded with knowledge about breasts and should be required reading for every nurse GP trainee woman and girl

At £11 50 it is good value if you can find a copy

BFT

ABC of Spinal Cord Injury 2nd Edition Eds Dav d Grundy Andrew Swain Pp56 British Medical Journal January 1993 UK £8 95 Abroad £10 50

With the seeming inability of sailors to distinguish between deep and shallow water after a couple of drinks being repeatedly demonstrated by the numbers of cervical spine fractures being casevaced from distant ports a book on spinal cord injury is appropriately timed However it is difficult to review a book which falls between many stools Instead of being parked firmly on the one labelled Undergradnates Nursing or Paramed cal this excellent overview of spinal cord injury has no obvious audience There is no foreword and the blurb says only it is for the non specialist which must be obvious as it does this vast field in 56 pages! Knowing that it is reprinted from a series in the *British Medical Journal* (not stated in the book) suggests that it is intended for doctors wishing to keep in touch with what is happening elsewhere in medicine If this is indeed the aim it has been achieved but for any other purpose it is inadequate it cannot even be recommended as an undergraduate text or for paramedical education Borrowing the review copy from the library at Haslar is recommended but for serious study or purchase there are more detailed books which while not as well produced or illustrated as this one are more appropriate to individual professional needs

MAF-R

Accidents and Emergencies in Children Rosemary J Morton Barbara M Phillips Pp 357 Oxford University Press 1992 £15 95

This is a welcome and long awaited publication on a specialist subject which has hitherto not been represented by a dedicated book The volume is a medium/small well bound paperback crammed with text of good printed quality The overall impression is of a very thorough and well planned book with no serious errors or omissions but one longs desperately for some visual relief from the intense text in the form of photographs or even just some diagrams This is most especially lacking in the chapter on practical procedures where there are only two basic and unhelpful diagrams The use of algorithms and flow charts would have greatly helped reinforce the thrust of the various chapters which are pretty hard going as pure text I liked especially the section on neonatal problems but there were only eleven pages compared with thirty four on cardiopulmonary resuscitation alone Major trauma only received thirty pages in total and surely this is the heart of such a book and would have benefited from an approach of greater depth and diversity more along the accepted ATLS

lines The ABC approach is used but a more expanded section is called for to cover this crucial topic It was good to see specific and excellent sections on the limping child and the management of children brought in dead There are very good chapters on burns and inhalation poisoning and ingestion as well as on abuse and NAI where surely photographs are essential There are useful separate chapters on parental anxieties and legal aspects both of which are not uncommon and can provide difficulties for an inexperienced junior doctor Highly recommended reading for all GP trainees and SHOs about to embark on their Accident and Emergency Department attachments It is inexpensive and good value

MS

Oxygen and the Diver K Donald Pp 240 SPA Ltd December 1982 £14 95

It comes as something as a shock to the uninitiated that oxygen at raised partial pressure can be highly toxic This monograph is largely devoted to an explanation of this phenomenon as it affects divers It is a long overdue review of the subject and although much of the work reported in this 240 page hardback volume has been published previously too much of it has rested undisturbed in historical references or inaccessible reports If the author had done no more than collate the work in this highly readable volume it would be worthy of praise However Donald's contribution is far greater than this Through his substantial contribution to research into the use of oxygen in diving not only has he employed his insight to interpret the available literature but he has gone to the trouble of publishing this book himself For that all who are involved in diving and diving medicine are indebted to him

With World War II the requirement arose for divers to be able to travel underwater covertly To achieve this a means of avoiding the release of bubbles of exhaled air was required The use of pure oxygen as the breathing gas was an obvious choice However prior to 1942 little was known about the toxicity of oxygen particularly in man The human experiments described in Chapter 2 which were undertaken by the Royal Navy in a remarkably short period laid the foundation for determining the safe limits for exposure to O which permitted the operational use of oxygen diving In today's ethical climate it is unlikely that this work could be repeated This report apart from its historical interest will therefore be invaluable to researchers in the future Other chapters cover more recent work on oxygen toxicity some of the problems associated with mixed gas diving and variations in divers physiological responses to carbon dioxide It is therefore a book of general interest to the diving physician

No review of this book would be complete without reference to Appendix 1 in which the author relates the circumstances under which he became involved in diving medicine research It makes fascinating reading and is a delightful account of how applied research can overcome operational constraints I was left wondering if the flexibility of appointing tasking and finding which pertained at the time contributed to the fantastic productivity of a small group of researchers? If it did let us hope that the potential rigidity of NMS will not impede the flair of Donald's successors should it ever again be required with such urgency

TJRF

Notices

Awards for Royal Naval Medical Staff School Video

At the International Film and Video Festival held in New York in December 1992 the Royal Naval Medical Staff School s video The Obstructed Airway took the Silver Medal in the Medical section This Festival has been held annually for the past 35 years and is intended to acknowledge excellence in non broadcasting media at the 1992 Festival there were altogether 2 500 entries from over 35 countries

The video has also recently won the British Medical Association s Gold Award

Announcement

The NATIONAL ex PRISONER of WAR ASSOCIATION Reunion and Annual General Meeting will be held at the Warner s Holiday Village Hayling Island Hants from Friday 22 October to Monday 26 October 1993 Ex POWs and/or supporters requiring further information are requested to send a SAE to

C Jago
74 Norfolk Road
West Harnham
Salisbury SP2 8HG

or to telephone 0722 333599

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Queen Alexandra's Royal Naval Nursing Service

Kathleen Harland MA

This book was commissioned to be written by Kathleen Harland for the QARNNS Centenary celebrations in 1984. The high cost of publishing and corresponding lack of funds put the project into abeyance until it was brought to the attention of the Editorial Committee of the Journal of the Royal Naval Medical Service. Only through the financial backing of the JRNMS, who have acted as publishers, has it been possible to print the book.

Mrs Harland has written a comprehensive account of the history of QARNNS from their inception in 1884 up until 1988. It is a book which combines history, general interest and some anecdotes in an easy to read style. She relates the initial antipathy to females being attached to the Royal Navy, the conditions under which some QARNNS Officers served in WW2 and describes the trials of service during the Korean War and latterly the effect of the Falklands War. The book will be of interest to historians in particular the comprehensive tables at the back of the book which cover a diversity of subjects including Honours and Awards and Establishments where QARNNS Officers have served. A wide selection of photographs provide contrast and further interest for those people who may prefer just to browse through the pages.

The book costs £8.50 which includes postage. For those who can collect direct from the Office of Surgeon Commodore (NMT) the cost will be £7.50. To order a copy of the book you are requested to complete the form below and send to: ISTO, Office of Surgeon Commodore (NMT), Monckton House, Institute of Naval Medicine, Alverstoke, Gosport, Hants PO12 2DL.

NAME _____ TITLE _____
(Please print)

ADDRESS _____
(Please print)

Post Code _____ Telephone number _____

Numbers of copies required _____ to be sent/for collection
(Please delete as appropriate)

If to be sent please complete the following section

I enclose a Cheque for £ _____ made payable to
Journal of the Royal Naval Medical Service

SIGNATURE _____ DATE _____

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Obituaries

We have recently learnt of the deaths of **Surgeon Commander Eric Hatfield Back VRD RNR** on 21 December 1992 and of **Surgeon Captain Teviot Selwyn Fimerl DSC VRD RNR** sometime PMO at HMS *Eaglet* on 27 January 1993 at the age of 76.

We have also learnt of the death in December 1992 of **Surgeon Lieutenant Angus Douglas Lvall Huppe Royal Navy** who served some 15 years ago with 45 Commando Royal Marines at **Wardmaster Sub Lieutenant Norman Clyde Martin Royal Navy** who retired in 1960 and died on 23 January 1993 at the age of 83 and of **Wardmaster Lieutenant John Raymund Wyburn** who died in Western Australia on 26 January 1993 at the age of 63.

We have now learnt of the death on 21 March 1993 of **Surgeon Commander Sidney Jenkinson Royal Navy** at the age of 92 and on 16 March 1993 of **Surgeon Commander Edward John Kenneth Weeks Royal Navy** who was in his 95th year.

As this Journal went to press we learnt of the death on 17 May 1993 of **Surgeon Captain John George Maguire CBE Royal Navy** who retired in 1958, and also of the sudden death of **Surgeon Commander Frederick Michael John Hiles OBE Royal Navy** who retired in 1990. We also regret to announce the death on 16 June 1993 of **Surgeon Rear Admiral (D) William Holgate CB OBE**. An obituary will be published in the next issue of the Journal.

Any personal reminiscences of the above officers will be welcomed by the Editor.

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SERVICE NEWS

ROYAL NAVAL MEDICAL AND DENTAL OFFICERS

APPOINTMENTS AND PROMOTIONS

To Surgeon Rear Admiral and appointed SRA (SMS)
22 April 1993
Surgeon Captain A Craig

As Queen's Honorary Surgeon
17 April 1993
Surgeon Commodore A M Hazell

As Queen's Honorary Dental Surgeon
12 April 1993
Surgeon Captain (D) E J Grant

As Consultant Adviser in Oral Surgery to MDG (N)
1 March 1993
Surgeon Commander (D) J V Holland

To Surgeon Lieutenant Commander
D B Macleod

To Surgeon Lieutenant Commander (D)
A Gow M J Hain K F Pilgrim

To Surgeon Lieutenant
M Every H D Wilhams

To Acting Surgeon Lieutenant
A N Bowie

HIGHER QUALIFICATIONS

Surgeon Commander P Jones — DIH
Surgeon Lieutenant Commander S C Sheard — MFOM
Surgeon Lieutenant Commander A W Murrison — AFOM
Surgeon Lieutenant Commander C D Gillen — DTM&H

ATTAINMENTS BY JUNIOR DOCTORS

Surgeon Lieutenants D A Jones and A R Bailey have passed FRCAnaes Part II

Surgeon Lieutenants A J Hudson and P A Mançais have passed MRCP Part I and Surgeon Lieutenant D J A Price has passed MRCP(U) Part I

TRANSFERS TO FULL CAREER COMMISSION

Surgeon Commander D V Lunn
Surgeon Lieutenant Commanders R F Stf Gent C J A Edwards S D Evans R W J Haddon M H Lygo
Surgeon Lieutenant Commander (D) D J Hall
Surgeon Lieutenants D J Summerton C J Hand R M Freece
Surgeon Lieutenant (D) C D J Redman

CONSULTANTS SENIOR SPECIALISTS AND SPECIALISTS

The following professional advancements are announced

Specialists
Surgery
Surgeon Lieutenant Commander A W Lambert
Occupational Medicine
Surgeon Lieutenant Commander A W Murrison
Accident and Emergency
Surgeon Lieutenant Commander M A Howell

NEW ENTRIES

Surgeon Lieutenants M W Farrar A C Palmer
Surgeon Sub Lieutenants J J Matthews D E B Ayers

PLACED ON EMERGENCY LIST

Surgeon Lieutenant Commanders S J Robinson F W King Lewis
Surgeon Lieutenant Commander (D) C M Elrick

RETIREMENTS

Surgeon Commodore (D) B Robinson
Surgeon Commander A Yates

NEWS OF RETIRED OFFICERS

Professor Sir Norman Blacklock OBE has been invested by the Queen on 7 May 1993 as a **Knight Commander of the Royal Victorian Order (KCVO)**

MEDICAL SERVICES

AWARDS

Petty Officer Medical Assistant C Checkley has received the **Queen's Commendation for Brave Conduct** for his action during a switchboard fire aboard HMS *Turbulent* on 30 April 1992. POMA Chenkley is now serving in HMS *Trenchent*

APPOINTMENTS AND PROMOTIONS

As Officer in Charge
Royal Naval Medical Staff School
6 September 1993
Commander G Marshall

To Lieutenant
W M Durning P L H Chilcott

Provisional Selection for Promotion to Warrant Officer to date 31 March 1994
C Jones

NEW ENTRIES

Sub Lieutenants A D Blocke T H C Bradford

HIGHER QUALIFICATIONS

Lieutenant Commander M Wagstaff has been awarded an MBA. Lieutenant I Coulton has gained the Diploma in Management Studies and Lieutenant Commander K Edwards has gained an MSn

QUEEN ALEXANDRA'S ROYAL NAVAL NURSING SERVICE

APPOINTMENTS AND PROMOTIONS

To Senior Nursing Officer
M E Proulx

NEW ENTRIES

Senior Nursing Officers C J Hall H K Wilford
S A Pike
Nursing Officers Z S Thompson P M Harusworth

HIGHER QUALIFICATIONS

Senior Nursing Officer A Dobson has been awarded a BA at the Open University

RETIREMENTS AND RELEASES

Superintending Nursing Officer C A Morris
Senior Nursing Officers J E Snape A J Nutbrown

ROYAL NAVAL RESERVE

PROMOTIONS

To Surgeon Lieutenant Commander
J M Norwood — *Flying Fox*

To Lieutenant Commander
P J Langley — *Southwink*

NEW ENTRY

Surgeon Lieutenant Commander K P Bryen — *Northwood*

PLACED ON RETIRED LIST

Surgeon Captain J M M Walsh — *Sussex*
Surgeon Lieutenant Commander R D Rawlins — *President*
Surgeon Lieutenant Commander D Bareford — *Forward*

REMOVED FROM ACTIVE LIST

Surgeon Lieutenant Commander
J M C Ward McQuaid — *Ceres*

RESIGNATIONS

Surgeon Lieutenant Commander D J Makepeace — *Eaglet*
Surgeon Lieutenant I Mellor *Completion*

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Manuscripts should be prepared in the Vancouver style [2] They should be typewritten with double spacing and with margins and should include title page abstract (of not more than 150 words) introduction method results discussion and references A convenient length is between 2000 and 3500 words plus essential tables or illustrations

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2 International Committee of Medical Journal Editors Uniform requirements for manuscripts submitted to biomedical journals *Br Med J* 1991 **302** 338 341

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Editorial

The Derriford Royal Naval District Hospital Unit

MDG(N) has a requirement to preserve trained medical manpower for operational deployment In 1990 the decision was taken by Ministers that three Service Hospitals in the UK would close and for the Royal Navy this was to be the Royal Naval Hospital Plymouth The manpower implications for MDG(N) were clearly as unacceptable as for the other two Services

When this concern was aired the Surgeon General was directed by the Deputy Chief of the Defence Staff (Programmes and Personnel) to examine the overall manpower requirement necessary to support a number of operational scenarios provided by the Defence Commitments Staff in the MOD This identified precisely the trained manpower that MDG(N) needed to fulfil his operational commitment Clearly this was more than could be trained and employed in a single RN Hospital and so the concept of the Military District Hospital Unit was born

For the Royal Navy this concept was refined into a proposed Royal Naval District Hospital Unit (RNDHU) based on Derriford District General Hospital (DDGH) in Plymouth The RNDHU will be a Royal Naval Medical Service unit providing a number of RN consultants with supporting medical nursing and paramedical staff working within the DDGH in Plymouth This will enable the RNMS to preserve its teams of uniformed personnel at the same time maintaining its ability to provide a secondary care capability for the Service population in the West Country

The Army and Royal Air Force will be setting up similar units For the Army there will be an MDHU in the Wessex region and for the RAF it will be in East Anglia Since neither has to implement plans until 1997/8 each is looking to the experience of the Royal Navy as a pilot project for setting up the RNDHU

MDG(N) has set up an RNDHU Implementation Steering Group (RNDHU ISG) This is chaired by D Med Org (N) and has representatives from MDG(N) RNH Plymouth Second Sea Lord's Department and MOD Contracts together with representatives from DDGH Plymouth Health Authority and SW Region Health Authority

This group is forging ahead with the major policy issues that require to be resolved and has devolved this work to a number of working parties whose remit is to agree the details of a Statement of Requirement for the provision of the RNDHU to be in place on the closure of RNH Plymouth in March 1995 The Statement of Requirement will form the basis of the contract between MOD and the NHS for the RNDHU The agreed contract should be in place by August 1994

It was agreed at an early stage that the concept of a separate military wing within DDGH was untenable from both the Service and civilian standpoint It would have been separated from all clinical infrastructure such as operating theatres physiotherapy and laboratories and a readily identifiable Service unit would have required to be surrounded by a security boundary The clinical structure of DDGH was therefore examined in more detail to determine how best the RNDHU could be incorporated It was decided that the RN personnel should be fully integrated into each of the clinical directorates forming RN firms within each major clinical discipline It is likely that each clinical area will run its business slightly differently The overriding responsibility of the RN personnel is to treat Service patients in exactly the same way as they presently do at RNH Plymouth whilst accepting that about 65% of the patients treated by Service doctors will

be civilians thereby preserving in the eyes of the Royal Colleges properly accredited training for junior medical staff Indeed the MOD is making a financial contribution to the running cost of this unit given its requirement to fast stream Service patients

Indeed the opportunities for training will greatly increase with routine access to experience within specialties not normally available to RNMS personnel such as Neurology Burns and Plastics Paediatrics and the possibility of cardiothoracic surgery in the future This experience will not only be available to doctors but to nursing staff and MAs alike

This project has highlighted a number of issues that will arise from the closure of RNH Plymouth These issues are presently being addressed separately from the RNDHU For example many aspects of Service primary care in Plymouth have been historically devolved to RNH Plymouth because of its proximity to HMS *DRAKE* When RNH Plymouth closes these will have to be reassumed by *DRAKE* Consequently the Sick Bay at HMS *DRAKE* will require enhancement to take on these extra responsibilities This task is presently being addressed by CINCNAVHOME

There will be a requirement to find Service accommodation for those single and married unaccompanied personnel working in the RNDHU who are presently accommodated in Service accommodation in RNH Plymouth Flag Officer Plymouth and the Captain HMS *DRAKE* believe that this accommodation can be found within HMS *DRAKE*

RNH Plymouth is for the most part listed buildings It is a large complex and its securing and closure will involve detailed planning The ultimate fate of the site has yet to be decided

A project coordinator has been appointed to ensure that all these issues are addressed so that when RNH Plymouth closes the transition to Derriford is as painless as possible not only for the RNMS but particularly for our customers

The closure of RNH Plymouth is an emotive issue The hospital has treated the sick and injured from the Royal Navy and Royal Marines since 1759 It has been routinely treating the population of Stonehouse and beyond since 1963 It has been used as a hospital to train Doctors Nurses and MAs for service in operational situations for many years and has fulfilled all these roles with pride and credibility It is now time to look to the future The formation of the RNDHU will mark a watershed in the professional development of the Royal Naval Medical Service We must ensure that neither the professional spirit nor the Service identity of RNH Plymouth is allowed to die but to be reborn into a unit where team spirit and professional pride in the special service we provide our patients grows ever stronger We want to show the Royal Navy that the medical support it receives is the most up to date professional and creditable service that any Armed Service could expect to receive and that the RNDHU at Derriford will play a major part in providing that service

J O Soul

J roy nav med Serv 1993 79 125 131

Hand immersion as a method of cooling and rewarming: A short review

M J Tipton, A Allsopp P J Balmi and J R House

Abstract

Many cooling and warming procedures have been proposed for the treatment of hyperthermic or hypothermic individuals One of the most recent of these is the use of hand immersion as a simple method to gain or lose heat In the present paper the principles underlying this approach and the evidence for and against hand rewarming/cooling are briefly reviewed It is concluded that hand immersion is likely to be more effective for cooling than rewarming individuals

INTRODUCTION

Many people as part of their leisure or work expose themselves to thermally stressful environments the armed forces for example may be required to operate in effective air temperatures ranging between plus and minus 50°C The problems of the environment are often compounded by the requirement for exercise such as when route marching or the need for specialist protective clothing when for example a nuclear biological chemical or thermal threat exists

It follows from this that methods for assisting in the defence of a normal body temperature and for treating individuals with dangerously raised or lowered deep body temperatures have been the subject of much research The physiological responses and medical problems associated with cooling and heating have been extensively reviewed[1-4] as have the numerous methods proposed for the prevention and treatment of these problems [5-10]

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Many of the techniques suggested for defending deep body temperature such as microclimate conditioning involve complicated equipment which itself often introduces penalties and logistical problems [6] The same potential problems surround many of the techniques used to treat hypothermic or hyperthermic individuals which are often sophisticated requiring specialised medical supervision and equipment

Recently there has been interest in the technique of immersing the hands in hot water to rewarm[11] or cold water to cool [12] In the present paper the principles underlying this approach and the evidence for and against hand rewarming/cooling are briefly reviewed

CONTROL OF PERIPHERAL BLOOD FLOW

Following hand immersion a reduction in blood flow occurs as water temperature is lowered such that blood flow is at its lowest (less than 1 ml/100 ml of hand tissue/minute) at about 15°C and rises as water temperature is increased to around 29°C Above this temperature there is a steeper rise in blood flow until maximum flows (approximately 35 ml/100 ml/minute) are reached in water at about 45°C [3]

The speed of these adjustments suggests a neurally mediated reflex with the afferent limb stemming from cold receptors located in the superficial subepidermal layer of the skin [4] In the hands and feet the efferent limb of the response is ascribed principally to alterations in the activity of sympathetic noradrenergic vasoconstrictor fibres [13] Similarly when the hand is warmed there appears to be a withdrawal of the basal sympathetic tone resulting in dilation of the blood vessels [14] The normal basal tonicity of these sympathetic neurones is high —

resulting in a blood flow of around 10 ml/100 ml/minute — allowing the increase in peripheral blood flow described above on withdrawal of this activity.

There has been considerable debate regarding not only the presence and role of a second vasodilatory efferent cholinergic pathway but also the vasoactive substance underpinning it. Bradykinin has been suggested by some authors as the active vasodilator substance [7,16] but this has been challenged by others [9,34]. The relevance of a cholinergic vasodilator mechanism for the regulation of skin blood flow is also disputed being considered as having either no major importance [1] or conversely accounting for 90-100% of the total cutaneous vascular response to hyperthermia in humans. The activity of such a pathway in the human forearm has been demonstrated by cholinergic blockage of sympathetic fibres [23] but these fibres do not appear to be present in the hands and fingers [24,25].

In addition to the above a centrally driven system which relies on the circulation of warmed blood also exists for the control of peripheral blood flow. Immersion of the denervated or pharmacologically blocked hand of a human in warm water increases blood flow to the contralateral non immersed hand after a period of delay lasting several minutes [6]. The time delay for this response is thought to correspond to the time taken for warmed blood to travel to the hypothalamus, the importance of the circulation for such a response has been demonstrated by venous occlusion [27] and by intravenous infusion of warm saline [8].

Finally cutaneous arterioles are sensitive to the direct action of heat[26] and cold [30] increased blood viscosity [31], circulating adrenaline and other local vasoactive agents implicated in reactive hyperaemia [1,7]. Such factors can therefore have a direct influence on peripheral blood flow.

The potential for the use of hands as a route of heat exchange depends heavily on the mechanisms controlling peripheral blood flow and their interaction for hand cooling to be effective peripheral blood flow must be maintained when deep body temperature is raised and the hands are immersed in cold water for hand rewarming to be effective the peripheral vasculature must be capable of opening when deep body temperature has been lowered. The question remains whether large alterations in the temperature of the hands can override the input from deep body thermal receptors and vice versa.

Within the extremities blood flow is primarily controlled by the arteriovenous anastomoses (AVAs). These are small vessels with thick muscular walls which connect the smaller arteries with the veins and thereby bypass the nutritive vascular bed. The AVAs drain principally to the superficial vasculature of the hands and forearms. Experimental evidence[32] suggests that the AVAs are centrally regulated. Peripheral blood flow is thought to be determined by the integration of thermal sensory inputs arising from the skin and deep body tissues [33-35] but deep body temperature appears to be the dominant factor in the control of skin blood flow [32-35].

The predominance of internal temperature for the control of peripheral blood flow has significant implications for the value of hand immersion as a route of heat exchange in some situations. This is explored in more detail in the following sections in which experiments designed to evaluate hand immersion are reviewed.

HAND IMMERSION AS A METHOD OF COOLING

The effectiveness of hand immersion as a method of cooling is dependent upon the maintenance of peripheral blood flow and a gradient between the skin and the water in which the hands are immersed. As discussed if water temperature is moderately cold (about 15°C) peripheral vasoconstriction will restrict blood flow in individuals with normal deep body temperatures this will cause a fall in skin temperature and a diminished gradient for heat loss as well as reduce the heat delivered to the periphery by mass flow.

In *Table 1* the results of three similar studies which employed hand immersion for 20 minutes whilst subjects were at rest in hot environments are summarised. In the study of Livingstone *et al* [15] subjects wearing Canadian Forces chemical protective clothing rested for 120 minutes in a hot room. During this time rectal temperature increased marginally (to a maximum temperature of 37.3°C). At the end of this period the hands were immersed in cold water but this did not significantly alter the responses seen in rectal temperature when compared with no hand immersion. This was despite the fact that the measured heat extraction from the hands calculated by direct calorimetry was 99 watts during immersion.

In a different study employing an impermeable clothing assembly [36] subjects worked to achieve

Table 1 A Comparison of the results from studies investigating the effect of hand immersion on the deep body temperature of subjects in the heat

Author	*Method*	*Water temperature at the start of hand immersion*	*Average deep body temperatures on hand immersion*	*Average reductions in deep body temperature during 20 minutes hand immersion*
Livingstone *et al* 1989	Five subjects at rest at 35°C dry bulb whilst wearing Canadian Forces chemical protective clothing for 120 mins before immersing gloved hands for a further 20 mins (Deep body temperature measured by rectal thermistor)	Control	Not stated	−0 03°C
		30°C	37 1°C	−0 04°C
		20°C	37 2°C	−0 04°C
		10°C	37 2°C	−0 03°C
Allsopp & Poole 1991	Six subjects at rest following exercise (430 watts metabolic rate) in 30°C dry bulb wearing impermeable clothing Gloved hands immersed for 20 mins when aural temperature reached 37 5 38 0 or 38 5°C	Control	37 5°C	−0 07°C
		25°C		−0 05°C
		10°C		−0 09°C
		Control	38 0°C	−0 34°C
		25°C		−0 54°C
		10°C		−0 62°C
		Control	38 5°C	−0 53°C
		25°C		−0 93°C
		10°C		−1 10°C
Holmes & House 1993	Four subjects at rest following exercise (310 watts metabolic rate) at 40°C dry bulb wearing semi permeable firefighting clothing Naked hands immersed when aural temperature reached 38 5°C	Control	38 5°C	0 0°C
		30°C		−0 7°C
		20°C		1 2°C
		10°C		1 5°C

body temperatures of between 37 5 and 38 5°C On cessation of work significant reductions in aural temperature were observed with hand immersion in cold water compared to the control condition without hand immersion (*Table 1*) A maximum cooling power of 197 watts was calculated from changes in body heat storage this figure is somewhat higher than that measured by Livingstone *et al* This difference may be explained by the methodological variation between the studies Allsopp and Poole[16] estimated rather than measured heat loss the deep body temperatures of their subjects were raised to a higher level and their subjects exercised rather than rested prior to hand cooling The second and third of these differences are likely to have had significant consequences for the gradient for heat loss the distribution of peripheral blood flow and metabolic rate when hand cooling was commenced

It is likely that the rubber gloves worn in both of the studies referred to above helped to maintain peripheral blood flow by raising the skin temperature of the hands and fingers and as a consequence reducing the local stimulus for vasoconstriction That the provision of such protection is not essential for hand immersion to be effective has been demonstrated by Holmes and House[37] who after raising the deep body temperature of subjects to an average of 38 5°C attempted to cool them by immersing their naked hands in water at approximately 30 20 and 10°C These authors report that deep body temperature fell at the fastest rate when the hands were immersed in the coldest water temperature The difference between the water temperature (mean 11 8°C) and immersed finger skin temperatures (mean 17 7°C) after 10 minutes suggests significant levels of hand blood flow were maintained

As discussed in the previous section some vasoconstriction would be expected at the hand temperatures recorded during these experiments after 20 minutes of cold immersion (10°C) of the hands (22 8°C 21 9°C [36] 17 2°C) That this vasoconstriction may not have been as intense as might normally be expected was probably due to the raised deep body temperature of subjects producing a centrally mediated inhibition of the vasoconstrictor response

This is supported by experiments in which thermal images were taken of the hands and forearms of one exercising subject who had placed his hands in a calorimeter containing water at 15°C for 20 minutes [12] The images show cooler skin over lying the peripheral superficial veins suggesting that cooled blood was returning to the deep body tissues via this route The authors suggest that under these conditions blood flows through the AVAs and the preferential pathway for its return is via the peripheral vasculature thus by passing any counter-current heat exchange system of the deep vessels [38 39]

Livingstone *et al* have reported that hand immersion (at 30°C 20° and 10°C) during 20 minute periods of moderate (455 watts) and light (283 watts) work in subjects wearing chemical protective clothing in a warm environment had little effect on deep body temperature The rate of rise of rectal temperature was attenuated slightly during moderate work but during light work it rose at a slightly faster rate when compared to without hand immersion

Hand immersion may prove impractical in circumstances where the maintenance of full mobility and manual dexterity are essential In such situations foot immersion may be of use the distribution of AVAs in the feet is analogous to that seen in the hands and recent work[30 41] suggests that significant levels of cooling can be achieved In the study of Livingstone *et al*[41] the rise in rectal temperature seen during exercise in a hot environment with foot cooling (0 92°C) was found to be significantly less than that observed without foot cooling (1 93°C)

It can be seen therefore that the level of cooling achieved by immersion of the extremities appears to vary considerably depending on whether the feet or hands are immersed during exercise hand immersion is used during exercise or during rest following exercise These variations require further detailed investigation

HAND IMMERSION AS A METHOD OF REWARMING

The best method of rewarming hypothermic individuals remains the subject of much discussion this is partly because the most appropriate approach varies according to the state of the victim the expertise and facilities available and the previous experience of the personnel involved The arguments for and against slow and rapid rewarming have been well reviewed [7]

Immersion to the neck in hot water (40-42°C) has proved an efficient and simple method of rewarming conscious victims it is however difficult to achieve in the field and poses major problems for continuous patient monitoring and treatment More invasive procedures such as peritoneal or thoraco/pleural lavage with warmed fluids haemodialysis and cardio pulmonary bypass require sophisticated facilities and skilled practitioners

Vanggaard and Gjerloff[1] have suggested that hypothermic patients in the absence of cardiac standstill could be actively rewarmed by immersion of the extremities in hot water They suggest that heating the extremities stimulates the AVAs to open producing a consequent increase in peripheral blood flow The blood flowing to the heated extremity is warmed and returns centrally via superficial veins thus bypassing cold intervening tissues and providing warmth directly to the deep tissue Vanggaard and Gjerloff[1] have reported that heat uptake by the forearm begins on immersion in water above 38°C and reaches 105 watts in water at 46°C the highest water temperature subjects could tolerate These authors also conclude that the heat uptake from the hand alone does not differ

much from the heat uptake from the hand plus forearm suggesting that the blood leaving the superficial veins of the hand has reached thermal equilibrium with the water bath

If effective this simple technique could have potential for the pre and hospital care of the victims of accidental hypothermia Unfortunately others have had difficulty reproducing the responses reported by Vanggaard and Gjerloff [11] Daanen and Van de Linde[47] compared four noninvasive rewarming methods in subjects whose body temperature had been lowered by approximately 1°C by immersion in cold water The methods examined included immersion of the hands and feet in water at 42°C this was found to produce a significantly greater afterdrop in oesophageal temperature than spontaneous rewarming in woollen blankets and aluminium foil The rate of rewarming did not differ significantly between these two techniques

Cahill *et al*[43] also investigated the post cold water immersion rewarming profiles of subjects whose deep body temperature had been reduced by approximately 1°C They found no significant differences in the rectal temperature profiles resulting from wrapping subjects in a padded rescue blanket compared with the same technique plus hand immersion in water at 42°C These authors reported some increase in digital skin blood flow during hand immersion and estimated that in the conditions of their experiment heat gain from hand immersion was a maximum of 12 watts This figure agrees well with the 17 watts measured during similar experiments [42]

Any advantage gained from this level of heat uptake appears to be negated by a concurrent reduction in intrinsic heat production associated with hot water immersion of the 12% of the surface area of the body represented by the hands Several authors[21 24 45] have reported that active external rewarming can reduce metabolic heat production and consequently produce a longer afterdrop and slower rate of rewarming when compared to passive rewarming

Whilst some of the inconsistencies in the findings associated with the efficacy of rewarming by hand immersion may be due to methodological differences it is an inescapable fact that for hand immersion to be of benefit in the treatment of victims of accidental hypothermia it is necessary for the peripheral vasculature to open and the extremities to be perfused when deep body temperature is below normal On balance the evidence suggests that any local vasodilatory influence on peripheral vasomotor tone arising from hand and forearm immersion in hot water is largely overridden by centrally mediated vasoconstriction due to low deep body temperature This is consistent with the conclusion that the AVAs are centrally regulated vessels[3] and as described above that deep body temperature is the dominant factor in the control of skin blood flow [34 35 46]

CONCLUSIONS AND IMPLICATIONS

The experimental evidence would appear to support the conclusion that peripheral blood flow is predominantly influenced by deep body temperature and as a result hand immersion for cooling is more effective than hand immersion for rewarming The figure of 12 17 watts heat uptake reported for rewarming by hand immersion contrasts with the 124 198 watts heat loss resulting from hand immersion in cold water when individuals are maximally vasodilated as a result of exposure to heat

Cooling by hand immersion would appear therefore to have some potential It is possible however that logistics and other practical considerations may preclude its use in some circumstances There is a clear requirement for some of the apparently contradictory findings associated with the use of hand immersion for heat exchange to be addressed

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Pre-medication of medical-risk patients for dental procedures

C R Priestland

Abstract

The necessity to provide prophylactic antibiotic cover to avoid infective endocarditis for patients receiving dental treatment leads on occasions to confusion and is frequently the subject of questions at postgraduate meetings There are several medical conditions which have in the past been considered to require prophylaxis which are no longer considered indications for such therapy However a definitive list of conditions necessitating antibiotic cover has been agreed (*Table 1*) There are several different schedules of prophylaxis which may be used in different circumstances This paper seeks to identify the main features of infective endocarditis and current prophylactic schedules accepted in the United Kingdom *Figure 1* outlines in the form of a flow diagram the decision making process involved in choosing the most appropriate schedule This flow diagram may act as a quick reference for use in the surgery

Infective (Bacterial) Endocarditis is an uncommon but severe infection predominantly affecting the heart valves but also capable of involving convolution of the aorta or ductus arteriosus The main effects of endocarditis are progressive cardiac damage and infection or embolic damage of many organs particularly the kidneys due to the formation of vegetations on heart valves which can break off and pass through the circulation until they become lodged in small blood vessels leading to both infection and ischaemic necrosis Infective endocarditis is fatal in around 30% of cases This infective endocarditis may arise as a result of a bacteraemia arising from dental procedures

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These procedures include any dental treatment which gives rise to gingival or mucosal bleeding including root debridement/scaling (periodontal therapy) cavity preparation necessitating instrumentation beneath the level of the gingival margin (restorative therapy) endodontic therapy impressions in a patient with gingivitis demonstrating spontaneous bleeding or any surgical or invasive procedure including dental extraction [3 4 5] In addition the American Medical Association recommends sub gingival irrigation or painting of isolated areas with chlothexidine or povidone iodine prior to extractions However prophylactic antibiotics are not recommended prior to injections for oral infiltration or block anaesthesia but are recommended before intra ligamentary anaesthesia [3] *Table 1* summarises those medical conditions necessitating antibiotic prophylaxis

High risk patients include those with previous infective endocarditis- coarctation of the aorta cardiac valve prosthesis rheumatic heart disease mitral valve prolapse with regurgitation hypertrophic cardiomyopathy ventriculoatrial shunts for hydrocephalus idiopathic hypertrophic sub aortic stenosis and various forms of congenital heart disease [3] Host factors further increasing susceptibility include immunosuppressive treatment cytotoxic agents and alcoholism The American Heart Association recommends an interval of at least seven days between dental appointments and as much dental treatment as possible at each appointment

Amoxycillin remains the choice for pre medication of medical risk patients This is due to the rapid rate of absorption of amoxycillin compared to penicillin Also the risks of penicillin allergy outweigh the benefits of its

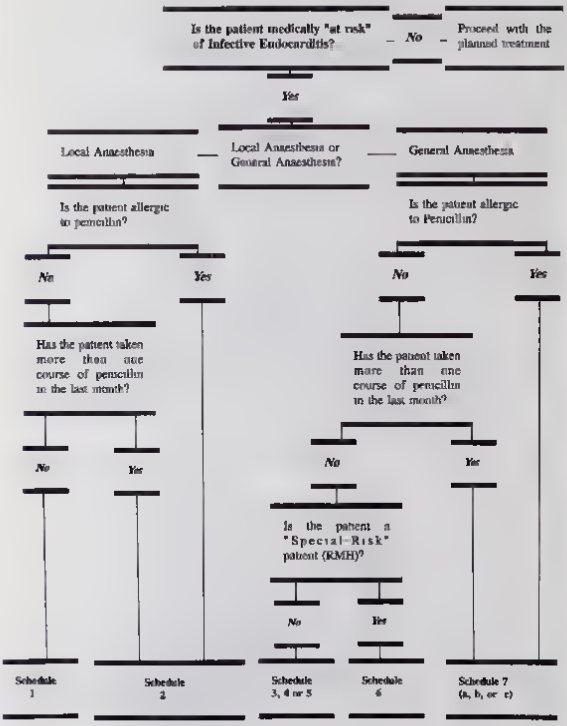

Figure 1 Flow-diagram for the choice of appropriate prophylactic antibiotic schedule

Table 1 Medical Conditions indicating the need for antibiotic prophylaxis [6]

Prophylaxis recommended	*Prophylaxis not recommended*
Previous Infective Endocarditis	Secundum atrial Septal Defect
Coarctation of the aorta	Coronary bypass surgery
Cardiac valve prosthesis	Congenital pulmonary surgery
Rheumatic heart disease	Previous rhaumatic fever without valvular dysfunct on
Hypertroph c cardiomyopathy	Coronary artery disease
Ventriculo atr al shunts for hydrocephalus	Mitral valve prolapse without regurgitation (except possibly with thickened and/or redundent valvas particularly in males age 45 or older)
Mitral valve prolapse with regurgitation	Previous Kawesaki disease without valvular dysfunction
Mitral valve surgery	Cardiac pacemakers and implanted defibrillators
Idiopathic hypertrophic aortic stenosis	Physiologic functional or Innocent heart murmurs
Indwelling vascular catheter (right heart)	Six months or longer after surgery for
Renal dialysis with A V shunt appliance	Ligated ductus arteriosus
Congenital heart disease	Secundum atrial septal defect
Ventricular septal defect	Ventricular septal defect
Patent ductus arteriosus	Autogenous arterial graft
Tetralogy of Fallot	
Complex cyanotic heart disease	
Systemic pulmonary artery shunt	
Aortic stenosis	

use One drawback to this change is the increased cost to the patient as amoxycillin is more expensive than penicillin V The accepted prophylactic antibiotic regimen in America has since December 1990 involved the use of amoxycillin or in the case of penicillin allergy erythromycin If for reasons of toxicity or allergy both amoxycillin and erythromycin are contra indicated clindamycin is used However the American regimen involves both an oral loading dose followed by a second dose six hours later The Endocarditis Working Party (EWP) of the British Society for Antimicrobial Chemotherapy (BSAC) have considered premedication of medical risk patients using erythromycin and in view of documented gastrointestinal side-effects the BSAC guidelines have been amended

The following schedules for different groups of patients are accepted by the EWP BSAC [7]

Local Anaesthesia

Currently the regimen of choice for general dental practice procedures under local anaesthesia where the patient is not allergic to penicillin and has not received more than one course of penicillin in the previous month involves

(Schedule 1) the oral administration of 3 g amoxycillin to be taken under supervision one hour prior to a dental procedure with no second dose (*children under 5 years quarter dose children 5-10 years half dose*)

If a patient is allergic to penicillin or has received more than one course of penicillin in the previous one month the regimen of choice involves

(Schedule 2) the oral administration of 600 mg clindamycin to be taken under supervision one hour prior to n dental procedure with no second dose (*children under 5 years quarter dose children 5 10 years half dose*)

General Anaesthesia

The regimen of choice for patients receiving dental treatment under general anaesthesia who are not allergic to penicillin and who have not received penicillin more than once in the previous month involves

(Schedule 3) the administration of 1 g amoxycillin intravenously or intramuscularly in 2 5 ml of 1% lignocaine hydrochloride at the

time of induction plus 500 mg orally six hours later (*children under 5 years quarter dose children 5 10 years half dose*) or

(Schedule 4) the oral administration of 3 g amoxycillin four hours before anaesthesia followed by a further 3 g orally as soon as possible after the operation (*children under 5 years quarter dose children 5 10 years half dose*) or

(Schedule 5) the oral administration of 3 g amoxycillin and 1 g probenecid four hours before the operation

If a patient requiring dental procedures (*a*) has a **prosthetic heart valve replacement** (*b*) requires a **general anaesthetic and is allergic to penicillin** or has received **more than one course of penicillin in the previous month** or (*c*) has had a previous infective endocarditis episode then the patient is considered a special risk patient and should be referred to hospital The guidelines for the management of these patients are outlined below

Premedication for patients not allergic to **penicillin** and who have **not had more than one course of penicillin in the previous month** involves

(Schedule 6) the administration of 1 g amoxycillin either intravenously or intramuscularly in 2 5 ml 1% lignocaine hydrochloride *plus* 120 mg gentamycin intravenously or intramuscularly at the time of induction to be followed by 500 mg amoxycillin orally six hours later (*children under 5 years amoxycillin quarter dose gentamycin 2 mg per kg body weight children 5 10 years amoxycillin half dose gentamycin 2 mg per kg body weight*)

Premedication for patients **allergic to penicillin** or who have had **more than one course of penicillin in the previous month** involves

(Schedule 7) slow intravenous infusion of 1 g vancomycin over at least 100 minutes followed by intravenous gentamycin 120 mg at the time of induction or 15 minutes before the operation is indicated (*children under 10 years vancomycin 20 mg per kg body weight gentamycin 2 mg per kg body weight*) or

(Schedule 8) intravenous 400 mg teicoplanin plus intravenous 120 mg gentamycin both at the time of induction or 15 minutes before the operation (*children under 14 years teicoplanin 6 mg per kg body weight gentamycin 2 mg per kg body weight*) or

(Schedule 9) intravenous infusion of 300 mg clindamycin over at least 10 minutes at the time of induction or 15 minutes before the operation followed by 150 mg orally or 150 mg by intravenous infusion over at least 10 minutes six hours later (*children under 5 years quarter dose children 5 10 years half dose*)

Apart from prophylactic antibiotic cover the most effective means for reducing metastatic bacteraemic infections from dental treatment or home oral hygiene procedures is the maintenance of excellent oral health particularly that of the periodontal tissues There is a fundamental requirement in such medical risk patients for a good standard of home oral hygiene and professional dental examination care and monitoring This must be emphasised to all such patients for without it gingivitis periodontitis and dental caries may develop with an increased risk of a bacteraemia following minor oral trauma resulting from mastication tooth brushing and dental treatment The BSAC in agreement with the American Heart Association stress the need for regular dental attentance for the maintenance of good dental health in patients who are susceptible to infective endocarditis This requires close liaison between the physician and the dentist Dental care should involve regular dental examination and treatment as appropriate accompanied by professional oral debridement preferably by a dental hygienist who should encourage motivation and improved brushing in these patients in addition to cleaning the teeth beneath the gum margins The application of 0 2% Chlorhexidine monthwash or gel (*Corsodyl*) to the gingival margins before dental procedures reduces the severity of any resulting bacteraemia and may be used to supplement the appropriate premedication schedule of medical risk patients [4]

Some medical risk patients with handicaps (physical or mental) which compromise their ability at oral hygiene measures may require such professional maintenance therapy on a more frequent basis to supplement the daily oral care carried out by either the patient or the nursing staff Detailed instructions for nursing staff need

to be provided by the dental team. The choice of frequency for dental professional support will be influenced by several factors including the patient's manual dexterity, motivation towards tooth cleaning, home use of antibacterial mouthwashes and dentifrices, medical-risk category, susceptibility to periodontal disease and dental anatomy. Some patients with crowding/imbrication of teeth will find maintaining meticulous plaque control difficult while patients with spacing will not encounter such difficulties.

In summary it is important in treating patients at risk from infective endocarditis that firstly they take a full part in their own oral healthcare by carrying out appropriate hygiene measures themselves in addition to receiving professional dental care and that secondly medical at risk patients receive the appropriate antibiotic schedule during any procedure which may result in a bacteraemia.

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Neurophysiological monitoring of acute neurological decompression illness

A W Murrison, E Glasspool and E M Sedgwick

Abstract

Somatosensory evoked potentials recorded over the scalp in response to posterior tibial nerve stimulation may provide a useful means of assessing the integrity of the neuraxis during the treatment of neurological decompression illness (DCI). The neurophysiological assessment of a case of DCI is described.

INTRODUCTION

The majority of cases of neurological DCI* do not possess hard physical signs. The diagnosis in such cases and the subsequent assessment of treatment efficacy are largely subjectively based and are therefore influenced by the placebo effect of therapeutic recompression which is likely to be considerable. Furthermore the examination of patients undergoing recompression may be hampered or even rendered impossible by the physical constraints imposed by the treatment chamber. Clearly a sensitive and objective means of remotely monitoring the integrity of the injured nervous system would be of great practical benefit. Any investigation used must be capable of operating in the confined environment of a compression chamber and must not delay the start of recompression as this would prejudice the therapeutic outcome.

Electrical stimulation of a mixed nerve trunk evokes a potential over the corresponding region of the somatosensory cortex. The somatosensory evoked potential (SSEP) to posterior tibial nerve stimulation is the neurophysiological technique most commonly used in the clinical assessment of the neuraxis. The first component of this W-shaped SSEP occurs approximately 40 msecs after the initiating stimulus and is referred to as the P40[1-3] (*Figure 1*). It represents the primary response of the foot area of the somatosensory cortex to stimulation.[4,5,6] The P40 latency is subject to minimal inter trial variability[7] and its latency is positively correlated with subject height.[8]

Autopsy evidence for clinically unexpected damage to the spinal cords of divers with or without histories of neurological DCI demonstrates that the dorsal column is a site of predilection.[9] The dorsal columns are held to be largely responsible for the transmission of electrical stimuli delivered to mixed nerve trunks.[10] Consequently the recording of posterior tibial SSEPs was considered to be a potentially useful means of assessing the integrity of the spinal cord during the treatment of DCI.

Neurophysiological investigation of DCI is supported by the demonstration of clinically unsuspected lesions using SSEPs in multiple sclerosis,[11,12,3] a disease which shares some of the features of DCI. Furthermore a parallel can be drawn between the well established use of SSEPs to monitor the health of the cord

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* The nomenclature of dysbaric illness in the text follows the recommendations of Francis and Smith.[1] Thus the term decompression illness (DCI) encompasses conditions which previously would have been referred to as decompression sickness (DCS) and cerebral arterial gas embolism (CAGE).

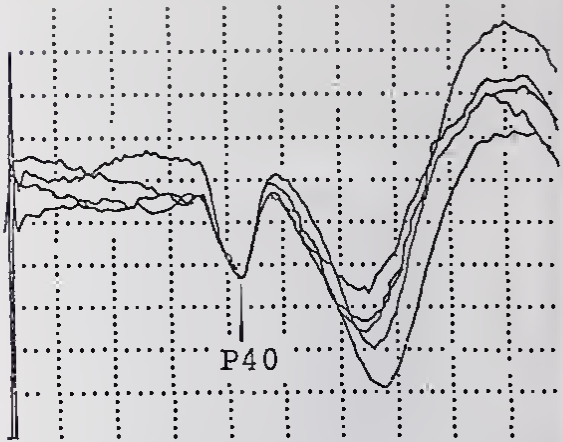

Figure 1 Somatosensory evoked potentials to posterior tibial nerve stimulation. Five recordings are superimposed to demonstrate the stability of SSEPs during recompression therapy in a normal control. The P40 component is indicated. The horizontal scale is 10 msecs/division and the vertical scale is 1·24 uV/division.

during spinal surgery[14, 15, 6] and the real-time neurophysiological assessment of patients undergoing recompression therapy.

The use of evoked potentials in the investigation of diving related disease has been surprisingly limited. Moon *et al*[7] considered SSEPs to be a less sensitive means of detecting pathology in acute neurological DCI than the physical examination. Nonetheless, objective neurophysiological evidence for treatment efficacy was given by the demonstration of SSEP improvement in three of the eight cases monitored by these authors during recompression.

METHOD

SSEPs were recorded using a Neuropak Four Mini (Nihon Kohden) machine. To reduce the fire risk inside the recompression chamber during treatment, the recording apparatus was located outside the chamber. Interface with the patient was achieved by means of through hull electrical penetrators. Electrical activity over the scalp was recorded with an electrode cap (Medelec) which incorporated the International 10-20 electrode montage system.[8] This facilitated the rapid placement of electrodes and was worn by the patient throughout the therapy.

Patients were asked to remain alert during treatment sessions and lay in the supine position. It was considered important that patients were comfortable and relaxed as tension might have caused patients to differ from controls in a way that was not related to the disease process.[9] This might have led to excessive muscle artefact and misinterpretation of SSEPs. Central and peripheral temperatures were monitored as casualties having recently left the water might

have shown neurophysiological improvements which were merely indicative of rewarming

Legs are more often affected than arms in neurological DCI.[20] Therefore the decision was made to record lower limb SSEPs routinely although clinical evidence of upper limb involvement would have justified the measurement of median nerve evoked potentials

Evoked potentials were monitored through an active electrode situated 2 cm posterior to Cz (Cz') which was referred to an electrode placed 2 cm posterior to the Fpz position (Fpz) (*Figure 2*) Extra scalp electrodes over the hand area of the somatosensory cortices (C3 and C4) in association with electrodes over the seventh cervical vertebra and both Erb s points would have permitted the recording of median nerve SSEPs Scarification of the skin underlying each electrode ensured that the impedance was kept as low as possible Earth electrodes were attached to the subject s limbs and bipolar stimulating electrodes were used with poles 2 5 cm apart The stimulator was placed in a constant position over the posterior tibial nerve below and posterior to the medial malleolus The risk of sparking was minimised by the use of electrode poles which incorporated saline soaked felt pads and care was taken to prevent shunting of the stimulus as a result of saline and sweat bridging the two electrode poles The stimulus consisting of a square wave electrical pulse of 0 2 msec duration delivered at 3 Hz from a constant current stimulator was applied to each leg in turn The intensity used for recording was that at which a definite twitch of at least one digit was observed or in patients from whom a twitch was not obtained the maximum tolerated by the subject

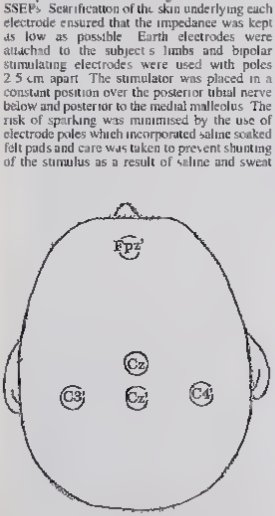

Figure 2 The electrode positions used for recording somatosensory evoked potentials

The single amplifier used was set for an analysis time of 100 msec and a sensitivity of 10 uV/division Low frequency filter was set at 1 Hz and high frequency was filtered at 500 Hz An automatic artefact rejection facility was used in order to ameliorate the effects of physiological noise made by swallowing eye movements and other muscular activities A pause facility was available to eliminate artefact caused by more strenuous voluntary muscular activity Two sequences of at least 500 recordings were averaged and superimposed to demonstrate reproducibility In order to ensure that conditions remained as constant as possible during recording sessions monitoring was not performed during depth changes or air breaks or within five minutes of them

Control data

The data from 54 normal volunteers previously acquired in the laboratory using the same recording protocol was used to determine upper limit of normal P40 latency values for the subject s height.[7]

Mitchell *et al*[21] investigated the possibility that treatment conditions might alter SSEPs in healthy individuals It was determined that breathing air and 100% oxygen at a pressure equivalent to 18 metres of sea water (msw) did not have a statistically significant effect on SSEP latencies or amplitudes In order to confirm this we measured posterior tibial nerve SSEP in four normal volunteers undergoing an RN Table 62 (UN Table 6) recompression profile SSEPs were monitored bilaterally before entry into the chamber in the chamber at atmospheric pressure at 18 msw at 9 msw and outside the chamber on surfacing *Figure 1* illustrates the stability of SSEPs in a normal volunteer during recompression therapy

ILLUSTRATIVE CASE

A 26 year old male diver performed two 35 metre dives separated by one hour of duration 54 minutes and 37 minutes respectively Ten hours after surfacing from the second dive he

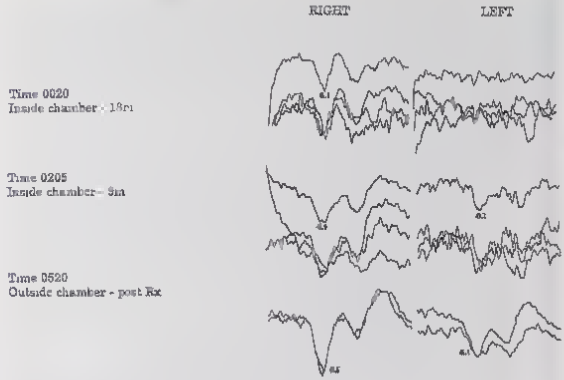

Figure 3 Posterior tibial nerve SSEPs recorded during the treatment of a patient with neurological decompression illness. P40 latencies in milliseconds are indicated. Note that the gain in the first two sets of recordings from the left posterior tibial nerve is half that of the other records.

experienced tingling in his left hand and foot. A full neurological examination 20 hours later was entirely normal. In particular there was no clinical evidence of dorsal column involvement. The first set of SSEPs was taken in the recompression chamber at a depth of 18 metres by which time they had been some symptomatic improvement. The P40 (at 46.8 msec) was significantly delayed on the right (upper limit of normal = 44.8 msec) and was absent on the left. After a further two hours at nine metres, the patient was asymptomatic. The right P40 latency had fallen to 45.0 msec, the emerging left P40 demonstrated a delayed latency (49.2 msec). On completion of the treatment the right SSEP had shortened further to fall well within normal limits (43.6 msec), the left P40 had improved in definition and latency (46.4 msec) although it remained significantly delayed despite the continued absence of symptoms and signs (*Figure 3*).

DISCUSSION

The SSEP abnormalities reported were considerable in view of the mild clinical presentation. The P40 delay on the right was particularly unexpected as this side was not involved clinically. The finding conflicts with previous neurophysiological studies into DCI which suggest that SSEPs do not add substantially to the information gained from physical examination [7,11]. However, it is compatible with the neurophysiological demonstration of sub clinical lesions in multiple sclerosis [1,11,2] and with the assertion that diving may cause occult damage to nervous tissue [9]. Although clinically the situation did not appear to change from the time of the second to the time of the third set of recordings (the patient having no neurological symptoms or signs on either occasion) SSEPs improved especially on the left. Thus there was evidence of continued

significant pathophysiological change over a relatively short time interval following the patient's reversion to clinical normality. The SSEP improvement on recompression therapy gave hard evidence of treatment efficacy and thus supported the diagnosis.

The case presented suggests that evoked potentials may be useful in plotting improvements with treatment in acute neurological DCI. Furthermore SSEPs appear to be capable of revealing sub clinical neurological deficits in DCI.

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Telemedicine: Treating the patient by remote control

Ruth Ling

A novice skier is taking the nursery slope at a nice steady pace when a show-off hot shot comes hurtling down the hill behind him gathering momentum as he approaches the learner They collide in a frenzy of billowing snow and flailing skis and limbs Even before he stops rolling and comes to a bumpy halt the novice knows that he s broken one of his legs

The emergency services are called and a rescue worker is soon on the scene — the popular ski resort called the Leeht near Aberdeen But it s a tricky break and he needs expert advice on how to apply the splint to the fractured femur So he switches on his headset and starts transmitting pictures of the injured leg to the nearest medical base the RGIT Survival Centre in Aberdeen There a doctor looks at the live footage of the patient watching his face and taking note of the exact nature of the fracture Internal injuries are suspected, so he uses an electronic stethoscope to monitor the skier s bowel and lung sounds Then he starts talking to the rescue worker on the mountainside instructing him on how to apply the splint and check for internal injuries

All this is done despite the doctor being in his office 20 miles away from the scene of the accident From his desk he is able to examine the patient laying in the snow as if he was actually there This remarkable feat is made possible with a new line in technical wizardry incorporating a two-way telephone and video camera called telepresence Using technology akin to virtual reality this illusion of being there effectively transports the doctor at home base to the remote location providing him with a link to the health worker in the field It s as if the base doctor is actually watching over his colleague s shoulder, looking at the problem and talking him through the task he has to do

The system called Camnet was developed by BT Research Laboratories (BTL) for medical use by the RGIT Survival Centre in Aberdeen The paramedic on the ground wears a headset with a small display screen earphones a microphone and a miniature video camera The camera captures images of the problem to be solved (such as the skier s broken femur) and sends these over a high speed data network using the Inmarsat A satellite communications system to the doctor at the base who may be thousands of miles away BTL say the images can be presented to the doctor on a single screen or even on a pair of small screens positioned close to the eye to provide a stereoscopic image

Through the satcoms link the doctor can speak to the headset wearer He can also indicate which parts to examine with a laser pointer

The display on the headset presents the image being seen by the doctor It displays the laser pointer and can also present data and graphical indications input at home base The Camnet headset produced by ABB Nern s UK subsidiary currently features a 60 mm × 17 mm manually adjusted camera which weighs less than 25 g with a single optimal focus and aperture setting It is possible that a zoom could be added which could be controlled by both the wearer and remote viewer The video information from the headset is transferred to an Inmarsat A high speed data (HDS) satphone for transmission over the satellite network Currently a series of cables provides the connection between headset and

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Figure 1 Operator wearing helmet

Figure 2 Camnet mobile link via satellite dish

and satphone but BTL suggests that optical wireless technology could provide a potentially cheap mobile secure and interference free alternative

The service provider Inmarsat is an international cooperative of 67 member countries with headquarters in London which provides global mobile satellite communications on land at sea and in the air Services include direct-dial telephones telex facsimile electronic mail and data connections

In the future Camnet may find applications in remote surgery Scientists at BTL say the system could be used to provide a direct surgical "presence" in keyhole operations using fibre optic probes — the surgeon could conduct the operation from thousands of miles away controlling the instruments and probes across the satcoms link, using feely virtual reality gloves which relay the sensations of touch experienced by the person at the scene of the operation

Throughout the West people are living to a far greater age and the burden on health care is increasing correspondingly This has resulted in the ratio of patients to medical practitioners being alarmingly high throughout the world It is hoped that in the not too distant future Camnet might be used to transport the presence of the primary health workers GP surgeon and consultant to rural hospitals and operating theatres and to scenes of accidents to give direct help to paramedics

Furthermore this application might be extended to support the joint viewing of x rays CAT scans and views from endoscopes and laparoscopes or as a means of accessing medical data and patient information at the patient's locale

In time the Camnet equipment may be put to use in a wide variety of applications not just emergency long distance medical and For example in the area of news gathering one person could replace a complete electronic news gathering team by using the system to collect reports at the (remote) direction of the news editor

It could also be employed in remote surveillance — by installing the micro camera behind a security officer's badge for instance The badge camera could be activated at any time

Figure 3 Almost like being there

Figure 4 Giving engineering instructions via the link

to capture the picture. The new breaking on the market to provide coverage of a disturbance within the knowledge of anyone other than the remote operator and the wearer.

Engineers installing and maintaining equipment or repairing computer hardware can also use the system to inspect the problem and instruct a non-technical user on how to deal with it.

The medical application of Camnet was developed in conjunction with the RGIT Survival Centre in Aberdeen. The world's leader in offshore survival training for the oil industry, the centre is also involved in the provision of health [illegible] throughout the world, including the British Antarctic Survey. The research unit at the centre has agreed UK distribution rights of the Camnet system for medical use with ABB Neta.

Dr Ross Maclean, a research officer at the centre, has been closely involved in Camnet's development. He says: 'This is a tremendous breakthrough in the field of remote medicine. It means that, should someone be injured in an area where medical help is not available first hand, but where the Camnet facility is, video pictures can be sent to a base where a doctor would be available to administer help and advice. It could be a life saver.'

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Diabetes care and the Royal Navy: the importance of a coordinated approach

R H Taylor and Elizabeth M Bardolph

Summary

The provision of coordinated diabetic care with the establishment of a dedicated diabetic clinic at the Royal Naval Hospital Haslar has improved the quality of life for the majority of service diabetics. The standard of diabetic control has improved greatly and there has been less sickness due to diabetes though the effect on invaliding is inevitably less obvious. Good glycaemic control a healthier lifestyle and a positive attitude achieved through understanding diabetes and its implications has been of overall benefit to the Royal Navy.

Diabetes is a common disease which affects at least two per cent of the population of Great Britain that is of the order of a million people. Of these about a quarter are insulin dependent or type I diabetics who develop their disease in childhood or early adult life. The remainder are the non insulin dependent or type II diabetics who are often overweight and usually present later in life. The onset of type II diabetes is often insidious and the diagnosis may not be made until complications are well established. The common feature in all diabetics is a relative or absolute insufficiency of insulin secretion by the endocrine pancreas.

DIABETIC CONTROL

Treatment of diabetes depends on measures to control the blood glucose and to normalise intermediary metabolism. Dietary regulation is essential for all diabetics and most will need either insulin injections or oral hypoglycaemic agents to achieve adequate metabolic control.

Surgeon Commander Taylor is Professor of Naval Medicine at RNH Haslar. Elizabeth Bardolph is a Research Assistant in the Department of Medicine RNH Haslar.

The longer term objective is to allow the diabetic patient to have a good quality of life which means being able to do all that non diabetics are able to and to have a normal life expectancy. There have been enormous advances in recent years in diabetic control and care which make these aims more realistic than ever before.

Diet

The diet has always been the mainstay of diabetes care though many diets recommended in the past were based on erroneous principles and bordered on starvation or at best malnutrition. Many different combinations of protein and fat and usually a low carbohydrate content were advised. It was not until the 1970s that the metabolic consequences of various diets were studied scientifically and advice was rationalised. The currently accepted guidelines of high starchy carbohydrate high fibre and low fat diets were published by the British Diabetic Association in 1981 and by most other national associations at about that time. These diets have been scientifically evaluated and will not only help to control and stabilise blood glucose but also to normalise other metabolic processes including reducing hyperlipidaemias. They are closely similar to those widely recommended for healthy living.

Insulin

There have been great advances in insulin therapy in recent years both in the insulins themselves and in their delivery. Purer porcine and bovine insulins reduced the risk of antibody formation to contaminants but the major breakthrough has been the development of human insulins either by chemical modification of animal insulin or by genetically engineered

synthesis These pure insulins are much more controllable and are without the risks of antibody formation All insulins have been U100 that is 100 international units/ml for some years so the previous confusion caused by the use of 20 40 and 80 strength insulins has now gone

Pen injectors and ready mixed insulin combinations make injection easier and simpler One of the greatest advances in insulin delivery has been the development of the basal bolus regimen using a once daily long acting insulin to provide the background level and small doses of short acting insulin before meals to match the absorption of that meal Continuous subcutaneous insulin infusion and multiple injection regimens are used but are limited to specialist research based units

Oral hypoglycaemic agents

These drugs have changed less in recent years though their use has been refined and some newer adjunctive agents are becoming available Viscous fibres such as guar have some role to play in modifying intestinal digestion and hence absorption The alpha glycosidase inhibitors, which reduce digestive enzyme activity slow digestion and thereby regulate absorption of carbohydrate Acarbose the first of these is now available

Monitoring

Accurate test strips for blood glucose monitoring help to improve control by providing quick and reliable checks of blood glucose levels particularly when used in a meter Meters are small inexpensive and allow the patient to measure with precision thus giving him the facility to control his condition fully Blood glucose monitoring is particularly important for type I diabetics and is done frequently in the early stages of stabilisation Accurate measurement gives flexibility to those with varied and active lifestyles allowing dietary and insulin adjustments to be done rationally The normal values aimed for in good diabetic control are 4-5 mmol/l fasting and no more than 8 9 mmol/l two hours after a meal which are the same as for non diabetics

Urinary glucose test strips are also easy and quick to use The strips in their container can be taken anywhere and measurements made as required For most diabetics with a normal renal threshold the absence of glucose in the urine indicates that the blood glucose has not risen above 10 mmol/l since the bladder was last emptied For most type II diabetics who tend to have high blood glucoses this will give a fair indication of the quality of control but will not give any indication of low blood glucoses

The glycosylated haemoglobin (HbA c) is particularly valuable in assessing overall longer term control Haemoglobin is a protein with a short turnover time of 90 120 days The extent to which glucose in blood binds to or glycosylates it is proportional to the mean blood glucose level averaged over the previous 4 6 weeks In contrast with blood glucose measurements which even if done systematically represent only a level at that moment the glycosylated haemoglobin represents the mean of all the rises and falls over previous weeks With good control it should be normal which for most laboratories is $<7.2\%$ but should be seen in combination with blood glucose levels because these may swing widely yet the mean may be within normal limits Wide swings upset intermediary metabolism and do not represent good control

Education

All these advances in diabetic care have been aimed at improving diabetic control avoiding arresting or at least delaying complications and allowing the diabetic person to lead a normal healthy life The most important step in achieving this has been to improve patient education which is now the primary objective

At the same time there needs to be greater awareness of diabetes in the population in general and more insight knowledge and understanding in health care professionals With good communication and correct factual information, the diabetic can be helped to lead an independent life taking control of his diabetes with confidence and able to behave and live as others do

Surveillance

Regular surveillance is important for all diabetics especially the young to ensure good control to watch for early signs of complications and to educate and support This is best done in a dedicated clinic with a team approach involving nursing and medical staff with a special interest in diabetes the dietitian the chiropodist and with ready access to the ophthalmic department In addition surgeons social workers the occupational therapist and the community team all need to have an understanding and involvement as required

The complications of diabetes are caused mainly by small and large vessel disease and by

hyperlipidaemia. Retinopathy, neuropathy and nephropathy carry a high morbidity and mortality if not treated properly and early. Even then the prognosis is poor and prevention is more effective whenever possible. The major cause of death in diabetes remains cardiovascular disease which still kills two thirds of all diabetic patients. Careful surveillance and intervention along with good diabetic control are beginning to make an impact on the morbidity and mortality of these complications. Recent evidence from the DCCT study in America has shown up to 60% reduction in incidence and progression of complications with good control and surveillance.

DIABETES CARE IN THE NAVY

Though diabetes is a bar to entry to the Services a number will develop the disease whilst serving. Because the age structure of the Navy is skewed towards a younger population with the majority being between eighteen and forty, the proportion of young type I diabetics is likely to be higher than in the general population. The provision of readily accessible health care, emphasis on fitness and regular medical examinations make it unlikely that many cases are missed or diagnosis delayed appreciably. If naval personnel were typical of the general population of this age group one would expect there to be five or six hundred diabetic patients. In fact screening at entry will exclude some, a reasonably healthy lifestyle will reduce the number of overweight people developing type II diabetes and many potential diabetics will not develop the disease until after they have completed their service. However it is reasonable to suppose that there would be between twenty and forty newly diagnosed diabetics presenting in the Navy each year, as is the case. Their health and their careers depend on the quality of medical care provided to give them the knowledge and insight to ensure good diabetic control.

In the past diabetics in the Royal Navy were treated under the care of any general medical firm. They were admitted as necessary, seen in the out patient clinics and most saw a range of doctors, many of whom had little knowledge of and sometimes little interest in, diabetes. There was no diabetic team, no regular nursing input and effectively no dietetic service. As diabetic care was scattered it was inconsistent in its aims, policies and practices. Patient education was limited by the knowledge of those concerned. The situation was not only somewhat unsatisfactory in the medical wards and clinics but there was no consistent support for diabetic patients undergoing surgery or being seen in any of the specialist departments. There was a need for a strategy, a coordinated approach with clear aims and most importantly of all a team which could be easily identified to provide care, education, advice and support.

In April 1987 a diabetic clinic was established at the Royal Naval Hospital, Haslar, run by a medical firm with a special interest in diabetes. The clinic was mainly of a traditional consultant based style but involved other professionals to an extent. Service diabetic patients were also seen in Plymouth by the same team working to the same guidelines. New patients appeared rapidly and the clinic has expanded steadily ever since and has become totally team oriented, with the diabetic nurse at the centre.

A new full time dietitian was appointed to replace the previous one session per week dietitian and subsequently a second full-time dietitian has been appointed. A chiropodist was appointed with extra sessions and both the dietitian and the chiropodist became actively involved in the Diabetic Clinic. A Nursing Officer attended the diabetic nursing course which is part of the training of a Diabetic Nurse Specialist and subsequently others have also attended this and other courses. Close links were established with the team in the Diabetic Day Care Centre at Queen Alexandra Hospital, Cosham with close agreement on all aspects of management.

Software for a diabetic database was commissioned and key data on all diabetic patients seen collected on that, with updating at every attendance. Subsequently all diabetic records have been transferred to MicroMed Medicine which was developed at Haslar in parallel with the diabetic program. This is a more comprehensive and general medical management system which allows more powerful analysis and audit. Records have been entered, kept updated and analysed by a part time research sister.

Equipment was obtained through normal Service channels and also from generous donations from the Gosport and Fareham branches of the British Diabetic Association, the Lions Club, the Patients' Welfare Fund, various private donors, the pharmaceutical industry and many others. This allowed educational equipment, books, videos, blood glucose monitors etc to be obtained for loan to diabetics and their families.

Links have been established with local general practices with their practice and diabetic nurses

with the community staff and all practices which now run their own diabetic mini clinics. The community diabetic nurse facilitator now attends the diabetic clinic and also sees newly diagnosed in patients before they are discharged. Study days, half days and evenings have been organised and well attended. Numerous naval doctors and nurses have been taught and trained in how to manage diabetes.

Much of the impact of the development of a diabetic care service is seen in the quality of care and that is difficult to measure. However there are some more objective criteria which reflect the benefits of the care provided.

Diabetic personnel in the Royal Navy

Since 1981 there have been 251 RN personnel who presented with diabetes mellitus recorded in *The Health of the Navy*. Of these 251, three have died although in no case was diabetes the main cause of death.

Of the remaining 248, 100 had been invalided up to the end of 1992. Most of the invalidings occurred early after the diagnosis of the disease: a total of thirty one being invalided within the first year and forty six within a further year of starting treatment. Five years is the longest time before a service diabetic has come before a Board of Survey and been invalided. The most vulnerable age group for invaliding is from entry to thirty four years. This is entirely predictable with the majority of serving personnel being between eighteen and forty, and the incidence of insulin dependent diabetes being higher in that age group. Records for invaliding for diabetes mellitus (ICD code 250) are available, but it is more difficult to identify diabetics who were invalided for another reason. Of the remainder just 50% continued to serve in a reduced medical category and the remainder left at their terminal date.

It is unusual for the older diabetic to be invalided, indeed there has only been one in the forty five to forty nine age group. Although the ratio of women to men in the service is increasing, only one woman has been invalided with diabetes in this period.

Looking at the invaliding rates by year, there appears to have been a downward trend since 1985 (see *Table*), even allowing for the strength of the RN being reduced steadily over the 1980s. On average there have been seven invalidings per year since 1987 as compared with nearly ten for 1981–1986. In 1991 there were only three. The percentage of invalidings for diabetes as against all invalidings has declined gradually. The number of invalidings for diabetes per 1000 strength of the force has also fallen which may reflect both a change in the age structure as well as an overall improvement in health (see *Table*).

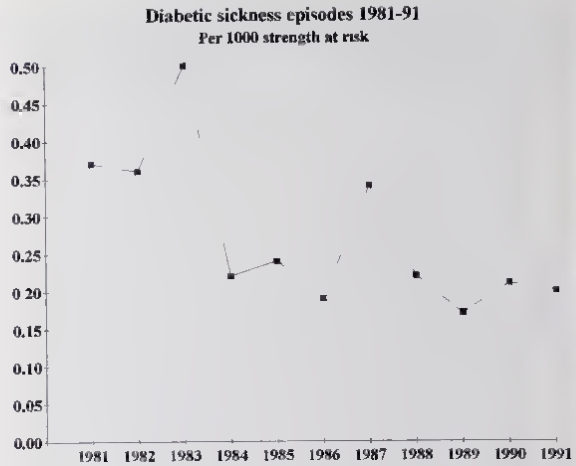
Sickness

Many diabetics need to spend a short time in hospital for stabilisation of their diabetes and for education. A number of serving diabetics also have a period of hospital sick leave ranging from one to three weeks or weekends away from the hospital environment to adjust their glycaemic control and gain confidence. Some diabetics will need further admissions because of unstable control or because of complications. Service in-patient admissions were analysed to find the average length of stay. Since 1987 hospital admissions for service personnel have not exceeded four days except when there were complications or other conditions involved and these have been exceptionally rare even when compared with non-service diabetics of the same age group.

The vulnerable age group as with the invalidings–is twenty to thirty four which is not surprising given the nature of the disease. Episodes of sickness due to diabetes have

Table Invalidings from the Royal Navy for diabetes mellitus 1981–92

Year	*1981*	*1982*	*1983*	*1984*	*1985*	*1986*	*1987*	*1988*	*1989*	*1990*	*1991*	*1992*
Invalidings for diabetes mellitus	4	11	11	18	8	7	5	8	8	9	3	9
Diabetics as a % of all invalidings	3·44	9·4	11	10·7	4·8	3·5	3·7	5·1	3·8	4	1·2	5·2
Diabetic invalidings per 1000 strength	0·05	0·15	0·15	0·22	0·11	0·1	0·08	0·13	0·12	0·14	0·04	0·14



declined over the decade even allowing for the reduction in the total number of service personnel (see *Figure*)

The benefits

The benefits of the establishment of a diabetic service have been considerable For the patients there is a coordinated consistent approach with a prompt response from the appropriate member of the team For the staff there is a concentration of effort and expertise which makes more efficient use of resources and acts as a focus for training others As a consequence there is now a much greater knowledge of diabetes spread more widely throughout the RN Medical Service For the Navy this means a much greater level of expertise and more confident and realistic advice For the diabetic servicemen there is a clearer approach not only to his condition but also to advising about the future The number of diabetics being retained in the Navy is changing gradually as attitudes change even at times of manpower cuts Diabetes mellitus will continue to be a cause of invaliding and sickness in the Royal Navy by the nature of the disease At RNH Haslar Service and civilian patients are seen together by the same staff using the same approach The emphasis for all is on good education confident knowledge and establishing the patient in control of his condition

It is this approach that has transformed the traditional consultant based diabetic clinic of the past to its present form where informed education by a team is the key

ACKNOWLEDGEMENTS

Numerous nursing medical and other staff have contributed to the development of this coordinated approach to diabetes care Aileen Anderson Angela Brighton Lee Butterworth Nicky Cornell Helen Dyer Katie Foster Elaine Hayward Hattie Marjoram Helen Morgan and Jenny Pearce all provided special expertise Dr Ken Shaw and Sue Craddock provided advice and support The staffs of the ophthalmic department and the pathology laboratory at Haslar have been valued supporters

SOURCES OF DATA

Statistical information has been obtained from the reports on *The Health of the Navy* published by the Defence Analytical Services Agency Stanmore who also provided more detailed data from searches of their records Medical records in RNH Haslar and the records of Medical Boards of Survey have provided supplementary information

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Aftermath

A Naval senior rating

INTRODUCTION

This anonymous piece was written in an attempt to explain why the writer was to come before a Medical Board of Survey. It has been submitted to the Journal with the permission of the writer and is published in order that medical officers might be made more aware of the problems facing some of our sailors. It should perhaps be pointed out that the writer remained in medical category P2 for most of the years he describes and that both drafting and medical authorities were unaware of the difficulties he was facing. The paper has not been edited to any extent apart from the removal of one name that of the writer's friend and the inclusion of a couple of explanatory phrases in parenthesis. Surgeon Commander O Connell has also given his permission for his name to remain in the text.

1982. 21st May. Falklands conflict and sinking of HMS *Ardent*. I was exposed to sights, scenes and actions which I was prepared for by my training, but not for personally. After a journey home with survivors from other ships, I returned to my family with many emotions everyone had noticed a change in me.

Back at work after survivors leave, first draft Devonport then Rosyth which involved three internal drafts, then Faslane which was a permanent draft. During this time I was uneasy seeing and smelling certain things which made me upset and emotional, dreams and sleep were a problem.

Drafted to HMS *Alacrity*. I had many feelings and was proud to be drafted back to sea. It was a different story when I arrived on board. I felt sick, scared and worried by my surroundings. I threw myself into my work and tried to ignore the dreams, flashbacks, sweats and headaches. Use of alcohol became common in harbour to obtain sleep. Deployment to the Falklands, to see the Falklands and where the action took place had its toll on me, then LMEM [redacted]'s twin brother (ie the twin brother of the writer's friend who was killed in HMS *Ardent*) joined and things got worse until Gibraltar 1986 when it became too much for me and I ended up in the care of (Surgeon) Commander O Connell.

Returned to the UK and RNH Haslar, G Block. Drafted to HMS *Drake* P7RD and employed as NBCDQ and after this to HMS *Invincible*.

My next draft was to HMS *Brazen*, on joining the ship we were deployed to the Gulf. During workup I suffered from sleeplessness and flash-backs which became worse on arrival in the Gulf. Work became very difficult due to my condition and I felt I was not performing as well as I should.

On our return journey an incident happened that brought this home to me. This was a fire on board which was caused by an 88 mm round going off in the Royal Marines messdeck. I was in charge of the four man team that was sent from forward to fight the fire. we got to the scene but fortunately did not have to fight the fire for I feel I would not have been able to maintain control as I was already on the edge. A team from aft dealt with the fire.

On return to the UK. I was drafted to HMS *Defiance* and life became a little calmer for me until I was drafted to HMS *Minerva*. I found it even harder to maintain control on *Minerva* due to confined spaces and different systems. Due to the ship having a refit and change of role to Dartmouth training ship enabled me to see out my draft on this ship. A fire which happened on *Minerva* in the Naval stores also caused me concern about my ability to cope with such a situation.

After another short draft to *Defiance*. I was re-drafted to *Minerva* on completion of this draft I was drafted to Phoenix Fire School. At Phoenix things went from bad to worse due to the nature of the draft. Everyday was a nightmare for me with many memories. Having to teach firefighting and the standards, I set myself slowly but surely put so much pressure on me and my wife that she asked for a divorce on the grounds of PTSD. This led me seeking medical help once more which I did receive and now find myself facing a Medical Board.

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Queen Alexandra's Royal Naval Nursing Service

Kathleen Harland MA

This book was commissioned to be written by Kathleen Harland for the QARNNS Centenary celebrations in 1984. The high cost of publishing and corresponding lack of funds put the project into abeyance until it was brought to the attention of the Editorial Committee of the Journal of the Royal Naval Medical Service. Only through the financial backing of the JRNMS who have acted as publishers has it been possible to print the book.

Mrs Harland has written a comprehensive account of the History of QARNNS from their inception in 1884 up until 1988. It is a book which combines history, general interest and some anecdotes in an easy to read style. She relates the initial antipathy to females being attached to the Royal Navy, the conditions under which some QARNNS Officers served in WW2 and describes the trials of service during the Korean War and latterly the effect of the Falklands War. The book will be of interest to historians in particular the comprehensive tables at the back of the book which cover a diversity of subjects including Honours and Awards and Establishments where QARNNS Officers have served. A wide selection of photographs provide contrast and further interest for those people who may prefer just to browse through the pages.

The book costs £8.50 which includes postage. For those who can collect direct from the Office of Surgeon Commodore (NMT) the cost will be £7.50. To order a copy of the book you are requested to complete the form below and send to: JSTO, Office of Surgeon Commodore (NMT), Monckton House, Institute of Naval Medicine, Alverstoke, Gosport, Hants PO12 2DL.

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Announcements

Surgeon Commander (D) C R Priestland Royal Navy Head of Oral Research at the Institute of Naval Medicine in Alverstoke has recently accepted the appointment of Royal Naval Dental Services Historian and Branch Archive Custodian In this new incarnation he is hoping to improve on the existing collection of photographs of historic interest and would therefore be most grateful to receive any suitable offerings from serving and retired officers of the Royal Naval Dental Branch

History of the Royal Naval Hospital Plymouth
Surgeon Captain P D G Pugh Royal Navy

In view of the imminent closure of the Royal Naval Hospital at Stonehouse the Editorial Committee has agreed to sponsor a reprint of this booklet which originally appeared as two articles in the Summer and Winter 1972 issues of the Journal of the Royal Naval Medical Service Medical Director General (Naval) Surgeon Rear Admiral A L Revell QHS has very kindly written a foreword and Surgeon Captain A R Marsh has brought the booklet up to date with a short resumé of what has happened to the hospital over the past 20 or so years

The reprinted booklet will be available for £3 50 a copy from both Plymouth and Haslar Hospitals and also from the Journal Office at the Institute of Naval Medicine in Gosport Copies can be ordered from the **Editorial Secretary, Journal of the Royal Naval Medical Service, Monckton House, Institute of Naval Medicine, Gosport, Hants PO12 2DL** Please make cheques payable to the Journal

Letter to the Editor

Sir

Climatic and environmental factors in the aetiology of decompression sickness in divers

Surgeon Commander Broome s original paper is of considerable interest The quest for deeper longer dives amongst recreational divers is leading to the use of breathing gases with a higher partial pressure of oxygen under the guidance of the International Association of Nitrox and Technical Divers Within a few years some amateur divers will be using rebreather sets

The lengthened dive times permitted by these innovations will place an increased thermal stress on the diver in our cool seas unless matched by parallel developments in thermal protection Using the author s rationale this would lead to impaired off gassing during the in water decompression phase and one might expect in increase in the incidence of acute decompression illness (ADI)

The author cites increased wind chill as an aetiological factor in ADI It is worth bearing in mind the practical implications of these conditions on the occasional mariner Reduced hydration as a result of sea sickness and possibly alcohol intake will in their own right precipitate ADI [1]

S V RUDLAND
Trainee in General Practice with interest in Diving Medicine

REFERENCE

1 Hallenbeck JM Anderson JC *Pathogenesis of decompression disorders* In Bennett PB Elliott DH eds *The physiology and medicine of diving* London Baillière Tindall 1982

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Book Reviews

Problem Solving in Nursing Practice K Hurst Pp 176 Scutari Press March 1993 £15 99 Distributed by Gazelle Book Services Ltd Lancaster

This book contributes to the theories of problem solving by describing a systematic empirical study of current practice The author a lecturer at the Nuffield Institute for Health Service Studies attempts to delineate theories of problem solving in order to examine their use within the profession Following a comprehensive review of problem solving in nursing medicine management and education the book describes the research carried out on a model from the general literature

Readers will be familiar with the phases of nursing process with comparison largely being made between an information processing system theory and a stages model theory Over 100 practising nurses took part in the research, each being interviewed using vignettes on clinical problem solving as a focus of discussion Content analysis of the interview transcripts concentrated on the recognition and non recognition of phases in clinical problem solving Further illumination of the theory emerged with the qualitative analysis of the transcripts where 51 categories of response are defined

The text is well written and the approach both novel and interesting The book is aimed at all levels of nurse but would be of particular interest to the qualified practitioner with a management role It is full of ideas worthy of further study in this important area of practice and is relevant to all specialists I would recommend it as a reference source

MB

Project 2000 Reflection and Celebration Ed B Dolan Pp 142 Scutari Press 1993 £15 99 Distributed by Gazelle Book Services Ltd Lancaster

A stimulating and well presented book the editor has brought together a number of contributors including practitioners managers teachers and students Each of the authors is able to consider the impact of Project 2000 from a different viewpoint giving a varied challenging and realistic appraisal of the achievements so far

The book is divided into three main sections First the historical development and initiation of the project is outlined highlighting the capabilities of the profession Secondly the impact of the project on the profession is discussed with particular reference to education empowerment and gender Finally, issues in current and future practice are discussed giving a glimpse of possible directions worthy of consideration Reflecting on Project 2000 is encouraging and motivating the consensus view of the authors being one of celebration and excitement toward future attainment

At times controversial the book is presented in a logical and easy to read style and provides an excellent update for those less familiar with the events that have led to the current introduction to the profession It is well worth recommending to all practising members of the profession and would also be of interest to other allied health professionals

MB

ABC of Colorectal Diseases Eds D J Jones M H Irving Pp 103 BMJ Publishing Group April 1993 £12 95

The ABC of Colorectal Diseases is one of a compendium produced by the BMJ bringing together articles that have been previously published in that journal The book is aimed as stated at the general practitioner and clinicians without specialist training in coloproctology In addition it is also aimed at gastrointestinal physicians and surgeons in training along with medical students and perhaps nurses in surgery and gastroenterology

The format is well known there is a series of chapters dealing with specific aspects of colorectal disease There are plenty of line diagrams supplementing the text along with illustrations showing pictures of individual pathologies and some histological slides together with barium studies The text is well laid out and tends to be a series of short statements in straightforward language giving an overview of the particular subject There is an absence of discussion around various topics but overall the text benefits from this straightforward and direct approach

The book therefore directs itself at those who have not got a specialist interest in colorectal disease Does it achieve this? Yes I think it does Overall this is a valuable and useful book for those who need a reasonable understanding for the assessment of patients presenting with

colorectal diseases It is certainly not adequate for those who are managing colorectal disease but it does not set out with this target in mind It does not set itself either out to be a reference book though it might be useful for the general practitioner as a reference text in helping management plans and referral patterns It is probably adequate for the basic surgical trainee coming up to his FRCS but it is certainly not adequate for the higher surgical trainee or the consultant

In summary this is a book that sets out to produce a straightforward and simple text supported by line diagrams for people who need to have a better understanding of colorectal disease but no specialising in it It achieves this aim more than adequately and would probably be helpful to both the general practitioner and the basic trainee It may be more than necessary for a medical student but it is laid out in such a way that a medical student would gain a great deal from reading it

RFD

ABC of Dermatology Second edition Paul K Buxton Pp 98 BMJ Publishing Group April 1993 £12 95

This is the second edition of the successful paperback book on dermatology from the British Medical Journal's ABC series Each chapter was published in the BMJ weekly in 1987 This has determined the length of each chapter and size of page The main disadvantage has been that the colour photographs are small and of mixed reproduction but this is more than made up for by the very reasonable price of the book

The layout of chapters is conventional there are chapters on eczema psoriasis their treatments bacterial fungal and viral infections nails hair and scalp and one on lumps and bumps A novel idea has been to include chapters on rashes with epidermal changes (which include lichen planus seborrhoeic dermatitis and the pityriases) and those arising from the dermis Unfortunately the author has not explained what he means by epidermal changes other than that they are similar to eczema or psoriasis One must assume that he means scaling as the sign of epidermal pathology although lichen planus typically does not scale and its pathology affects the dermal epidermal interface rather than the epidermis In contrast rashes arising principally in the dermis are characterised by a normal epidermis ie a smooth surface Thus he includes the erythemas drug eruptions vasculitis and urticaria quite rightly here I would have put granuloma annulare here as well rather than under the skin and systemic disease The association of granuloma annulare and diabetes is controversial to say the least Granuloma annulare is the classic dermal lesion as the surface is always smooth a feature distinguishing it from, say annular tinea or psoriasis which are both scaly Other chapters include blisters leg ulcers black spots skin and systemic disease and the skin and autoimmune disease Pemphigus and pemphigoid get double mention in chapters on blisters and autoimmune disease The chapter on minor procedures is a good idea The skin manifestations of AIDS also have been included No small book on dermatology can cover the subject satisfactorily but I think this book provides a good introduction for students general practitioners and other non dermatologists With its low price it has already proved to be a publishing success

RFA

Fraud and Misconduct in Medical Research Eds Stephen Lock Frank Wells Pp 203 BMJ Publishing Group January 1993 £24 95

Stephen Lock until recently editor of the BMJ and much involved in exposing medical frauds and Frank Wells the medical director of the Association of the British Pharmaceutical Industry are an influential pair of editors and both contribute chapters to this anthology Their topic is an uncomfortable one which has been highlighted by various scandals and revelations in the last 15 years Some have resulted in withdrawal of published data some in disciplinary proceedings before the GMC and other professional bodies and a few culminating in total tragedy, not only for the perpetrator but for many other innocent researchers as reputations and departments collapsed

Early chapters contain many gripping anecdotal accounts of misconduct and fraud in recent years as medical research activity has increased exponentially The pressure to succeed, the need to publish the competition and rivalries of academic life and simple misguided human nature all seem to motivate fraud Pressures on the pharmaceutical industry to produce regulatory data on new drugs to escalating standards has cascaded pressures down to researchers within the industry and to clinical trialists Research misconduct as seen from various points of view show different perspectives on this disturbing problem Guidelines and standards from various countries are reviewed a little repetitively The final and

very important practical problem which is addressed is what to do about suspected or recognised fraud The guidelines are clear and in the UK at least the professional penalties can be considerable often including being struck off the GMC Register

This concentrated book makes fascinating and disturbing reading The ingenuity the complexity and the naive innocence revealed behind these human and scientific stories are a salutary reminder to all who undertake or read the results of medical research to maintain impeccable standards

RHT

Epidemiology for the Uninitiated Third edition D Coggon Geoffrey Rose DJP Barker Pp 69 BMJ Publishing Group April 1993 £6 95

Since the first edition of this valuable little book was published as a collection of papers from the BMJ in 1979 epidemiology has made an enormous impact on modern medicine Population data on disease is a tool not only of the science of medical care but also of health care politics The quality of its collection, its interpretation and the application of epidemiological data to problems of disease management requires skill and special knowledge This book aims to give the reader an overview of epidemiology and a demystification of its specialised terminology illustrated by many practical examples The jargon can be difficult and a glossary of terminology would be helpful for quick reference though the indexing is good and reasonably comprehensive

Following a general introduction quantification of disease in populations is explored through disease frequency incidence prevalence and mortality Problems of comparability error and bias are explained clearly Chapters guide the reader through how to do an epidemiological study and separate ecological longitudinal case control and cross sectional studies There is a new section on randomised controlled trials and an update on screening The new chapter on reading epidemiological reports is particularly valuable because this is often the first contact that the clinician has with this important science

This third edition is lucid factual and interesting In every way it lives up to the description on the cover of the short authoritative guide to understanding epidemiology As such it should be a key text on any reading list for those specialising in clinical or other branches of medicine whether in hospital general practice or the community

RHT

ABC of Diabetes Third edition Peter J Watkins Pp 56 BMJ Publishing Group March 1993 UK £7 95 Overseas £9 50

Diabetes is common affecting at least 2% of the UK population and up to 10% in some parts of the world There are almost as many undiagnosed cases who will present with complications of nephropathy retinopathy neuropathy or cardiovascular disease 15% of all blindness 50% of non traumatic amputations are due to diabetes and two thirds of diabetics will die of cardiovascular disease In addition to the chronic morbidity and its associated mortality there are the acute risks of poor control which can be life threatening too But many of the problems of diabetes are avoidable An understanding of the principles of management by the patient the family and the members of the diabetic care team with good education will optimise control and minimise risks

Peter Watkins ABC of Diabetes now in its third edition has become a classic guide to diabetes management and the care of the diabetic patient Its clear practical common sense approach makes it an ideal introduction and continuing resource for all who care for diabetic patients The text has been updated from the last edition of 1988 to include new developments amongst them the St Vincent Declaration of 1989 which makes a contract between the patient and the carers to improve control reduce complications and provide appropriate specialist facilities

The style is clear and factual keypoints are reiterated in bullet point tables and diagrams are used widely to make important points visually Practical techniques are shown with clarity and basic rules for treatment and monitoring stated in plain language This new edition continues the excellent standard and should be both widely available and read by all who have any dealings with diabetic patients A first class practical handbook

RHT

Yellow Jack and the Worm: British Naval Administration in the West Indies 1739-1748 Duncan Crewe Pp 321 Liverpool University Press May 1993 £17 50

The unusual title of this excellent little book refers to the disease yellow fever and a particularly voracious worm the teredo navalis

which thrives on the number of warships and wharves These were but two of the scourges faced by those responsible for the administration of the West Indies Station in the years 1739 1748 when the British Government were anxious to enhance their sphere of influence in this part of the world and as a result went to war

This book has its origins in a PhD Thesis by the author Dr Duncan Crewe and is published for the Department of History of the University of Liverpool by the University Press As one would expect from the academic nature of the publication it is very thoroughly researched and crammed full of detail based largely on unpublished archive material which is listed in the comprehensive bibliography

The various chapters of the book cover all aspects of the administration of the area including manning ordnance victualling and the sick It is this latter chapter which will be of particular interest to members of the Royal Naval Medical Service In it Dr Crewe outlines the enormous problems faced by the Sick and Hurt Board of the Admiralty problems which they had already faced in the UK during the previous century but complicated by the distances involved and the primitive communications that existed at the time

The book makes fascinating reading, particularly for those interested in the history of the Navy and Dr Crewe is to be congratulated on a scholarly but eminently readable text

ALR

ABC of Otolaryngology Third edition Harold Ludman Pp 58 BMJ Publishing Group June 1993 £8 95

As a Consultant Otolaryngologist from King's College Hospital London and an FRCS Examiner Mr Lndman is a well known figure in British Otolaryngology He is a well respected Surgeon and the author of a number of standard text books

An ABC of Otolaryngology is the third Edition of a publication previously entitled an ABC of ENT This Edition incorporates a number of recent developments within the specialty of ENT and the addition of colour to the illustrations add to their clarity In this book Mr Lndman gives a concise over view of this specialty in his usual meticulous manner Topics are presented in terms of presenting problems or symptoms rather than pathology which makes the book ideal for the newcomer to ENT The clinical findings of different conditions are described and explained [illegible] pathology then [illegible] the initial treatment and longer term [illegible] element of the patient This book is easy [illegible] with many illustrations on each page to compliment the text and is strongly recommended as an introduction for General Practitioners or Medical Students

RJNG

The Physiology and Medicine of Diving Fourth edition Eds Peter J Bennett and David H Elliott Pp 613 W B Saunders Company 1993 £70

First published in 1969 Bennett and Elliott has over the past 24 years established itself as one of the if not the authoritative texts on hyperbaric physiology and diving This is the fourth edition — perhaps it should be the fifth as a Russian edition was published in 1988 — and maintains indeed improves upon the high standard set by previous editions In the ten years since publication of the third edition the popularity of diving as a sport has increased greatly whilst in the commercial sector dives to depths that until recently were considered as experimental have become standard operating practice

The editors have provided the reader with detailed reviews of all aspects of diving medicine There are three completely new chapters on Fitness to Dive Clinical Hyperbaric Oxygen Therapy and the Long Term Health Effects of Diving The remaining 15 chapters have all been extensively revised and in some cases completely rewritten Furthermore the new descriptive classification of the decompression disorders is described in detail and used throughout this edition All of the 22 authors nine of whom are new who have contributed to this volume are acknowledged experts in their particular fields Unlike previous editions that have suffered from poor presentation of data this edition is to be commended for the clarity of presentation and ease of reading The excellent index is particularly welcome as although many will read this book from cover to cover for others it will serve primarily as a source of reference One criticism of the book is the failure to use common units with the reader having to convert between metres feet bar psig etc from chapter to chapter In summary this fourth edition retains Bennett and Elliott's place as the textbook of hyperbaric physiology and medicine and ensures its continuing place on the bookshelves of all those with an interest in hyperbaric medicine

PJB

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Obituaries

Surgeon Rear Admiral (D) William Holgate CB OBE FDS RCS(Eng) died peacefully at home on 16 June 1993

Surgeon Rear Admiral (D) W J V Forrest CB writes

William Holgate was born in York the only son of Anthony Holgate a businessman After local schooling he was sent to Scarborough College for his further education He decided to make dentistry his career and he entered Guy's Hospital where he qualified LDS RCS(Eng) in 1927 After registration in 1928 he applied to join the Royal Navy and gained the London and Haslar Gold Medal for the highest pass marks in the stiff competitive entrance examination quite equal to Finals

The Dental Branch established in 1921 was formed effectively to proffer dental care within the Royal Navy especially in the New Entry Training Establishments This was not often an easy task with youngsters for whom treatment care was a new experience but with tact encouragement and patience these early dental surgeons succeeded splendidly — Bill was one of these and their work contributed to the health and welfare of naval personnel in no mean way

Bill joined RNH Haslar for course and soon afterwards did a two year stint there before being appointed to the cruiser HMS *Cornwall* in 1931 and thence to the Training Establishment HMS *Impregnable* in 1935 This was followed by his appointment to HMS *Maidstone* the Submarine Depot Ship in Malta in 1938 and to the Royal Naval Hospital in Colombo in 1941 On his return he was appointed to the Training Establishment HMS *Royal Arthur* in 1944 soon followed by his promotion to Surgeon Commander (D) and in 1948 to his appointment as Senior Dental Surgeon HMS *Terror* Singapore and on the Staff on CinC Far East Back in the UK again he became Senior Specialist in Dental Surgery at RN Hospital Plymouth and on promotion to Surgeon Captain (D) was appointed to the staff of Flag Officer Plymouth in 1954

Bill's main interest was in undertaking clinical dentistry and whatever appointment he held he maintained his own surgery to carry out treatment However in 1957 he was appointed as Director of Dental Studies and Research at RN Medical School Alverstoke where there were minimal facilities for such a task Undaunted as ever he approached it with his usual energy and enthusiasm and sense of fun and turned it into a very rewarding experience He had a most excellent technician and they set about making fine models of dental procedures for patient enlightenment and education They devised an intricate collapsible mobile stand to take to exhibitions and conferences to show these models and to encourage recruitment

He evolved a tailor made mouthpiece for shallow water diving to fit each diver individually This was a great improvement

He also devised similarly individual mouth guards for Royal Naval boxers These did not prove such a success for while they prevented knock outs they tended to increase punishment to the head so were dropped[1]

In 1958 (pre video days) Bill produced an excellent series of cartoon colour slides correlated to a gramophone record script This was undertaken to standardise the obligatory dental health lecture to new entrants It was really a comic strip carrying a serious message more likely to hold the attention of the audience Bill recorded the script himself — it proved a great success

He became attached to the MRC unit at Harwell and became involved in research projects there involving teeth One of these was a collection of wisdom teeth for analysis to interpret the fall out of Sr90 following the nuclear bomb tests in the Pacific

He was promoted to Surgeon Rear Admiral (D) and Director of the Dental Branch in 1960 At his own request he was placed on the Retired List later in 1961 to become the Chief Dental Officer at the Ministry of Health a post he held for ten years

On retirement from such a long and busy career he sought the peace and quiet of life in the Isle of Wight and bought a house near the cliff edge at Shanklin It seemed ideal for his wife Inga who was an artist and for him to create yet another garden Unfortunately their life was tragically shattered on the night of the hurricane in 1987 The roof of their home was completely dislodged and landed 100 yards away His wife suffered heart failure to which she sadly succumbed the following day So ended his very long and happy married life with Inga whom he had married in 1933 They had a son and daughter

After the tragedy his house had to be demolished but with true grit a wonderful spirit and support from his family he continued to live nearby

In 1989 he made a very happy marriage with Irene Pongher a widow Sadly in 1993 Bill s health began to deteriorate and he died peacefully on 16 June just prior to his 87th birthday Bill Holgate was appointed CBE in the 1951 Birthday Honours Honorary Dental Surgeon to the Queen in 1958 and CB on retirement from the Royal Navy in 1962 He was elected FDS RCS(Eng) in 1963

By his death we have lost a splendid colleague who lived life with verve to the full He loved company was an excellent companion and a great ambassador for his chosen profession We mourn with his family who survive him the passing a loved respected and lively man

Surgeon Rear Admiral Patterson David Gordon Pugh OBE who died at his home in South Africa in July 1993 joined the Royal Navy as a Surgeon Lieutenant in January 1950 having previously served for two years with the RNVR He was promoted to Surgeon Lieutenant Commander in August 1954 to Surgeon Commander in June 1961 and to Surgeon Captain in December 1969 From 25 May 1954 he was appointed Medical Officer in Charge Royal Naval Hospital Malta and his final appointment in June 1975 was as Surgeon Rear Admiral (Naval Hospitals) at RNH Haslar He retired from the Royal Navy on 14 March 1978

We have recently learnt of the death on 28 June 1993 of **Chief Petty Officer Medical Assistant Frederick James Duncan MacLaughlin GM** CPOMA MacLaughlin was awarded the GM for services in Northern Ireland An obituary will be published in the next issue

We have also learnt of the recent death of **Surgeon Captain Edward William Bingham OBE** Surgeon Captain Bingham joined the Royal Navy for Short Service as a Surgeon Lieutenant in April 1927 and transferred to the Permanent List in 1930 He was promoted to Surgeon Lieutenant Commander in April 1933 to Surgeon Commander in 1939 and to Surgeon Captain in 1951 He retired from the Royal Navy in 1957 He spent much of the early part of his Service career in Polar exploration and two papers on his exploits were published in the Journal in the October 1932 and July 1948 issues

We regret to announce the sudden death of **Senior Nursing Officer Claire Louise Smith QARNNS** on 13 September 1993

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SERVICE NEWS

ROYAL NAVAL MEDICAL AND DENTAL OFFICERS

APPOINTMENTS AND PROMOTIONS

As Medical Officer in Command, Royal Naval Hospital Plymouth
26 October 1993
Surgeon Captain C W Evans

As Consultant Adviser in Radiology to MDG(N)
1 September 1993
Surgeon Commander J I C Hogg

To Surgeon Lieutenant Commander
S E F Bree M A Glover N J Mahony J G Pollard, R M Preece M D Stewart D J Summerton F R Davis D J A Price T Winch R J Guy T S J Walker C R M Foster A Hudson

To Surgeon Lieutenant Commander (D)
A G Cooper C D J Redman R J Colbeck

To Surgeon Lieutenant
L M Brunton D A Freshwater E J Lacey M J Stenlou J E Smith A J M Broadley R F Rickard C G Streets

To Actng Surgeon Lieutenant
F R Conrier B J Dekker N Greenberg R M Heames K A N Horiberg L A Wallis P C C Tamayo M D Bramden A R Gibsou C W Heath D J Hughes L Lawson C A Parry D W Potiphar M B Snowden R Sullivan

Provisional Selections for Promotion to date 31 December 1993

To Surgeon Captain
M R O Connell

To Surgeon Commander
A V Balmer P J Benton M M Scott D A Hett

HIGHER QUALIFICATIONS

Surgeon Commander P Jones — AFOM
Surgeon Commander P H Hardy — MRCGP
Surgeon Lieutenant Commander K E Blaydes — DRCOG
Surgeon Lieutenant Commander R W J Haddon — AFOM
Surgeon Lieutenant Commander R M C McNeill Love — MRCGP
Surgeon Lieutenant Commander P R Dryden — MRCGP
Surgeon Lieutenant Commander A S Hughes — MRCGP
Surgeon Lieutenant Commander J R Robinson — MRCGP

ATTAINMENTS BY JUNIOR DOCTORS

Surgeon Lieutenant M W Farrar has passed Part II FRCAnaes

TRANSFERS TO FULL CAREER COMMISSION

Surgeon Commander A Yates
Surgeon Lieutenants J B McKeating C J Hand

CONSULTANTS, SENIOR SPECIALISTS AND SPECIALISTS

The following professional advancements are announced

Consultants
General Internal Medicine and Rheumatology
Surgeon Commander R W Smith — 29 October 1990

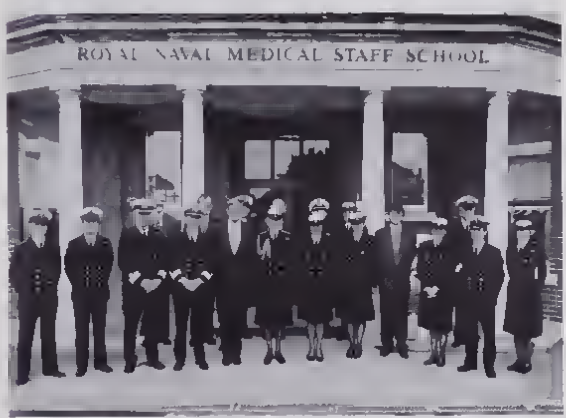
Specialists
Occupational Medicine
Surgeon Lieutenant Commander G M Barker

NEW ENTRIES

Surgeon Lieutenants D G Simpson
Karen A Dowdeswell
Surgeon Lieutenants (D) K J Ellis G J Knepil
Acting Surgeon Lieutenant M D Clarke
Surgeon Sub Lieutenants M A Fisher Kate R E J Prior

PLACED ON EMERGENCY LIST

Surgeon Lieutenant Commander A D Newland
Surgeon Lieutenant Commanders (D) C G Hardman A D Keeling M J Hahn A M Gow A G Cooper
Surgeon Lieutenants F P G Kelly M D Stoneham F R Davis



Commandant Nursing Officer June Tilley QARNNS Surgeon Commodore (NMT) Terry Hazell and Vice Chancellor Neil Merritt of the University of Portsmouth with officers representing SRA(SMS) RNH Haslar and the Royal Naval Medical Staff School and other members of the University following the unveiling of a ceremonial plaque to commemorate the link of the Nurse Education Department RNMSS with the School of Health Studies University of Portsmouth

Surgeon Rear Admiral A Craig QHP (left) shaking hands with Surgeon Rear Admiral (Designate) I R McG Eden OBE QHP as he relinquishes the post of Surgeon Rear Admiral (Support Medical Services) on 1 April 1993

RETIREMENTS

Surgeon Commodore J M Beeley
Surgeon Commanders S Q M Tighe W K Saywell
Surgeon Commanders (D) I L Kelly
J R T Hayward C J Woodward M T Bostock

NEWS OF SERVING OFFICERS

Surgeon Lieutenant Commander M S Smith has been granted **Membership of the Institution of Occupational Safety and Health**

Surgeon Commander P Litchfield has been appointed **Assistant Registrar of the Faculty of Occupational Medicine**

Surgeon Commander J J W Sykes has been elected **Chairman** of the **Central Southern England Group** of the **Society of Occupational Medicine**

The Alan Birst Memorial Prize for 1993 has been awarded to Surgeon Lieutenant Commander R P S Gent

MEDICAL SERVICES

AWARDS

The **Sick Berth Petty Officers Efficiency Medal for 1992** has been awarded to Petty Officer Medical Assistant P K Fitzpatrick

APPOINTMENTS AND PROMOTIONS

To Lieutenant
A J Skinner I M Dell T J Ryder
B R Richards

RETIREMENTS

Acting Commander R A Pollard

Bef [illegible] Surgeon Captains (D) B R [illegible]n GHDS [illegible]tc R [illegible] [illegible]ll [illegible] Dental Capt [illegible]t lunch at HMS *Nelson* [illegible] last day [illegible] April 1993. From the Fut Surgeon Captains (D) J H [illegible]aves R S H [illegible]ly, F J Grant and St [illegible] C [illegible]ll [illegible]tc (D) T J C Hall

The three doctors on board HMS *Intrepid* were closed up for Volunteer Band duty as the ship left Portsmouth on 22 July 1993. From left to right: Surgeon Lieutenant David Jones DPMO, Surgeon Lieutenant Commander Anthony Lambert PMO, Surgeon Lieutenant Commander Mark Groom... 1st Lt 814 NAS.

QUEEN ALEXANDRA'S ROYAL NAVAL NURSING SERVICE

QUEENS BIRTHDAY HONOURS 1993

Associate of the Royal Red Cross
Senior Nursing Officer A J Nutbrown

Member of the Order of the British Empire
Acting Petty Officer EN(G)
G F Wright

APPOINTMENTS AND PROMOTIONS

To Senior Nursing Officer
A A Coleman

To Nursing Officer
D J Knight

NEW ENTRIES

Nursing Officer J M Collier

HIGHER QUALIFICATIONS

Superintending Nursing Officer F A Russell has been awarded a **Bachelor of Arts** by the Open University.

Superintending Nursing Officer L J Butcher has been awarded a **Master of Arts in Education** by the University of Southampton.

Senior Nursing Officer D T Elliott has been awarded the degree of **Bachelor of Science with Honours in Nursing Studies** by the University of Portsmouth.

RETIREMENTS AND RELEASES

Superintending Nursing Officer M K Garstang
Senior Nursing Officers F S Hall S A Densem V Melrines S R Verrechia A J Livingstone F S Haddon

ROYAL NAVAL RESERVE

PROMOTIONS

To Surgeon Lieutenant Commander
R A Wheeler — *Wessex*

PROBATIONARY STATUS REMOVED

Surgeon Lieutenant W M Buckett — *Forward*

PLACED ON RETIRED LIST

Surgeon Commander K B Queen — *Calliope*
Surgeon Commander T M Buckmill RD — *President*
Surgeon Lieutenant Commander J W Hillyard — *Dragon*
Surgeon Lieutenant Commander I K Ritchie — *Cleverhouse*
Surgeon Lieutenant Commander A R Chartier — *Graham*

RESIGNATIONS

Surgeon Lieutenant Commander D Morgan — *Southwick*
Surgeon Lieutenant Commander A M Davison — *Calliope*
Surgeon Lieutenant Commander D R D Roberts — *Calliope*
Surgeon Lieutenant Commander L N Baldwin — *Flying Fox*
Surgeon Lieutenant Commander G L Ikiars — *Saltford*
Surgeon Lieutenant C E Hambling — *Camperdown*

AUTHOR INDEX

SUBJECT INDEX

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The names and addresses of subscribers to the Journal of the Royal Naval Medical Service are being transcribed from a card index system to a computer database which it is hoped will be easier to maintain In order to ensure that this database is as far as possible kept up to date subscribers whose address details are at present incorrect are invited to complete the tear off form below and return it to the Editorial Secretary The form may also be used to notify future changes of address

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